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Independent User Group

Monitor

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Omnimon and Ultimon compared

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PCW SHOW

This years PCW show must have been a huge success for Atari, after all they were the only exhibitor with a hall to themselves! 2Meg and 4Meg versions of the ST were announced, the 2080ST and 4160ST respectively. Macintosh and IBM emulators were displayed, as was a demonstration of the blitter chip in action. ST owners will be able to upgrade their machines for around £60. There was lots of new software including ST Karate and War Zone from Eidersoft with MIDI compatibility for super sound from your synthesiser. Karate Kid 2 from Microdeal is in production and should be available around November. Psygnosis previewed Deep Space and Arena. Deep Space is a Star Raiders type game and Arena is an ST version of Summer Games. GST showed 1st Word Plus and 1st Mail. There was little joy for eight-bit owners however, only Red Rat had anything new to offer (see Hot gossip). There seemed to be total support for the 16-bit range, but hardly any for the 8-bit. Atari Corp. may be supporting the 8-bit range in general throughout the world, but Atari (UK) certainly isn't, their attitude seems to be that 8-bitters should upgrade to 16-bit. Well thats fine if you can afford it, but those who can't seem to be at a dead-end.

MONITOR AT ATARI SHOW 2

The next Atari show will be held at the New Horticultural Hall in London at the end of November. Monitor will be there, so come along and see us on Stand 106, thus supporting your club and Atari computers.

CREDITS

Editor	Roy Smith
Art Editor	Peter Blackmore
Technical Editor	Ron Levy
Technical Editor	Keith Mayhew
Adventure Editor	Steve Hillen

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★ "Truly software with imagination." Matthew Tydeman, Monitor, September 86.

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Super 3D Plotter II

Atari 48K and Disk Drive
A complete 3D design, Display and Animation Package.
By Elfin Magic (UK License by Demon Software Ltd.) £29.99 Disk Only
By Matt Tydeman

When I was first asked to review Super 3D Plotter II (S3DP) I couldn't help but remember the time I entered data into a similar package of some years back – 3D Super Graphics by USA Software was a program I actually purchased in 1981, during a flying phase of interest in this area. Times have changed since the days of 3D Super Graphics and a new breed of 3D design programs have hit the scene.

S3DP is a complete, full screen, high resolution 3D design system capable of producing the most professional results for any task. The program, was originally found on a remote BBS by Tom Hudson, late of Analog Computing and now the brains behind Degas and CAD-3D for the ST from Batteries Included. Hudson adapted the program for the Atari and published the finished coding in issue 16 of Analog Computing under the title of 'Solid States'. Randolph Constan, a programmer inspired by Hudson's program, took up the challenge of making a better program. S3DP version 1.0 in 100% machine code was then formed and released by Constan and his own company in America – Elfin Magic. Time passed and it was soon realised that the power of this program could be improved still further so another challenge was undertaken, and S3DP Version 2.0 was formed, a version capable of updating the screen memory a massive 6 times per second!

The process of creating 3D images by use of screen memory is called Bit Mapped Graphics – something ST owners will be all too familiar with. Bit Mapped Graphics are achieved my changing the screen memory at high speeds to give the illusion to the eye of movement. This is a highly complex process and has been attempted by many programmers, only to find that even with complex calculations the speed required just cannot be achieved – until now that is. S3DP has great power and includes great detail, high resolution graphics, real-time total control, full screens and amazingly fast movement, all goes to make S3DP a professional program, ready to fulfill the limitless imagination of its user – be it for graphics animation, design or perspective drawing (one friend of Demon Software is using S3DP for Kitchen design/layout).

When first loading S3DP the only options open to you are to Load and Create; other more detailed options arrive later, after you have loaded your image or created your own – these include Edit, Display and Save. Loading and Saving is a simple task which I appreciated in this program – no drive prefixes are needed and automatic extenders take care of you having to remember those easily forgotten 3 letter codes. Once an image has been loaded it can be displayed in Low, Medium and High resolutions, all of which can be changed while the image is being rotated with no lack of movement or screen dimensions. With your image safely in memory, control can now begin. Your image can be rotated through all dimensions; X, Y and Z with a positive and a negative spin (up or down). All rotations are independent of each other enabling any highly difficult rotation/effect to be achieved quite easily, even the centre axis at which the image rotates around can be changed and if tied together with a change in plane, a circular path can be made, resulting in the image appearing to fly in a circular fashion. To make the results more interesting and realistic a zoom can be introduced making the image look as if it is coming increasingly closer on a circular path. Zoom can be controlled with great detail from a fraction of a degree to a magnification of 2 or more – with this feature intact you can position yourself 'inside' the image and watch it spin and rotate around you!

A hidden surface feature offers further realism, as it eliminates certain points of the image which fall behind the surface in the foreground of the picture. Each image consists of points and lines which 'float' in space (your screen). These points (S3DP can handle up to 255 points/lines in one single image – rumour has it that another supplimentary disk will be available soon and will have capabilities of over 1000 lines!) are constantly maintained and computed in a memory table allowing the computer to process the information on every screen update in order to be aware of where 'in space' the points and lines start and finish. This technique allows the computer to work out which points and lines are in front of or behind others – it will then block out or hide these lines, thus giving the illusion of a solid object. This process takes some time to compute and so results in slightly jerkier movement through each axis. Foreground surfaces can, once hidden line removal has been utilised, be filled to give each side its own colour letting you distinguish which surface is which.

Creating an image is slightly harder than the simple 24 key rotational control, (for which a key-card is supplied), but in comparison with many of the other 3D design systems, S3DP is a package which has been well worked out in terms of actual design of your 3D

images. As far as I am aware, S3DP is the only 3D Design package in which you actually draw your image – no entering of numerical data is necessarily required in the initial stages of construction. It is possible to construct an image (which has been pre-drawn on paper) without touching the keyboard at all – all options can be selected with the joystick and its button. Simply position the cross at the desired location and press your button, here, a line point will be drawn and the prompt for a second point will be displayed – move to the location of the end of the line and press your button once more – your line will now be drawn and a prompt for another point will be displayed, its all that easy.

Once the image is complete, the Data Editor can be engaged. Here it is possible to make any significant changes to your work by seeing the numerical data of all the points you just entered with the joystick and altering them to remove, extend or adjust any points or lines which fall short of your drawing capabilities; One can even add more points/lines.

Surface Clipping, Surface Priorities, Automatic Program Conversion, Screen Overlay, Merging, Printouts capable of printing to any Dot Matrix printer (1029 setup routine included on disk together with many more Epson compatibles) in a resolution almost as high as the highest resolution of an ST and a fully explanatory manual of 60 pages (including pages on the principles of CAD/CAM, Hidden Line Removal, Printer Setups and File Structure of saved images) make the overall package a dream to use. Never before have I seen a package of this nature so simple to use and understand – truly, software with imagination!

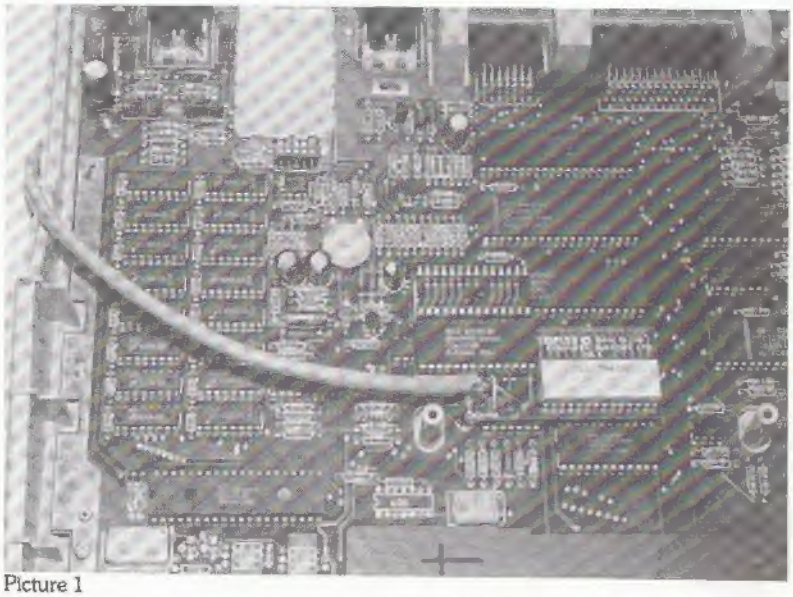
Omnimon and Ultimon!

Resident Machine Language Monitors for the Atari 800XL/130XE
Reviewed by Matthew Tydeman

Many have said, and I cannot deny that such comments have been made, that Ultimon! is in some ways similar to the American equivalent Omnimon by CDY, Computer Consultants of Texas. For this reason I have decided to review both Omnimon and Ultimon! and give a full explanation of each.

I fail to see the relevant point when people, mainly those who have seen neither product for themselves, can produce such a rash and biased statement regarding this similarity question. What is a Resident Machine Language Monitor without features to search, display, edit and compare? By their very nature, they must be similar in many ways, but can also vary greatly!

Ultimon! XL/XE and Omnimon XL/XE are both totally new Operating Systems for the Atari Computer. The OS is basically identical to Atari's built-in XL/XE OS, but has certain areas rewritten and enhanced for additional power. New coding has been programmed in for the Ultimon!/Omnimon Monitor features, but in addition to these points there lie many more hidden features. Ultimon!'s so called XOS, and Omnimon's OSN is based around revision 'B' OS and have the same vectors and system entry points. Atari's OS (rewritten with the introduction of the XL/XE series) was changed from the 400/800 OS in order to incorporate the built-in self test, warmstarts, international character sets and parallel port handlers. It is for this reason that some 400/800 software does not run on the newer XL/XE's, as the programs call to areas in memory where new routines now lie. XOS and OSN cure this problem because they are based around Revision 'B' OS resulting in further compatibility with older software with the added bonus of having your Translator disk in memory, totally resident. XOS also includes such features as an increased cassette load/save baud rate of 820, changed Anti-Coldstart bytes, Echoed joystick/paddle ports and a 7 pixel wide character set instead of the usual, now 'dull' 6 pixel character set. OSN has similar features, some enhanced over XOS and includes a programmable cassette load/save baud rate (600bd through 1525bd. Even though the OS will support exceedingly high Baud rates, your cassette drive will not. The maximum working speed I've achieved is 1200 but this will vary from cassette to cassette and so is not 100% reliable),



Picture 1

doubled keyboard response time and, if coupled with RAMROD XL, faster Floating Point routines of up to 4 times the speed of the original OS.

Configurations

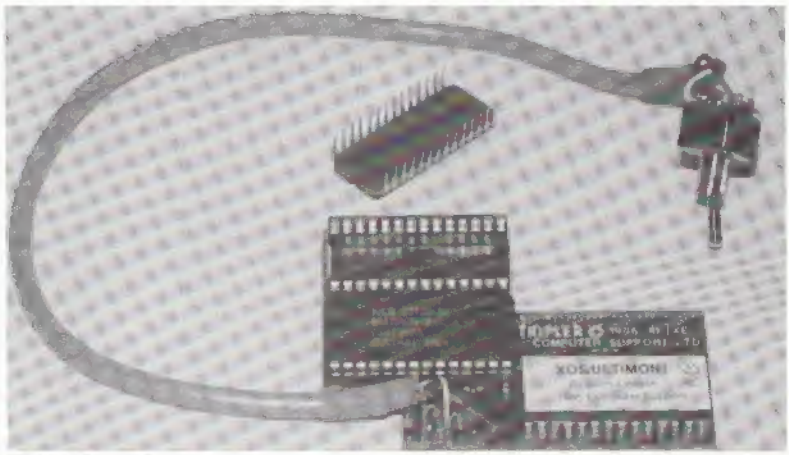
Ultimon! and Omnimon come complete on a single plug in replacement 28-pin 27128 IC, see Picture 1, which is to be placed directly onto the motherboard. Opening the machine reveals (after voiding your warranty) your existing 28-pin Atari OS which on early Atari XL's is plugged into a soldered IC holder, allowing simple removal of the Atari OS and simple plug-in installation of the new OS. Newer XL's and all XE's (except development) have the 28-pin OS chip directly soldered to the board, resulting in the need to desolder the Atari OS with

a powerful solder sucker. The new XOS/OSN must then be soldered to the board, possibly causing problems if you may want to sell your XL/XE, forcing you to remove the new OS (unless the new owner is happy to have it).

For those with a bit more money to spend, both Computer Support and CDY offer a piggyback 3 socket 28-pin PC board. CDY's RAMROD is used in the same way as Computer Supports' TRIPLER and is soldered to the motherboard and then allows switching in and out of three totally different Operating Systems or applications. On the TRIPLER Board (see Picture 2) one can easily see the three sockets together with the three-position switch, which is mounted outside the machine (Picture 3 top left) to switch in each application; Ultimon!, Omnimon, Atari Standard OS, 80 columns or Superchip.

Resident Machine Language Monitors

A Resident Monitor, when installed is always available to the user. Once running, complete control of your computer is given to you and allows the ability to examine and modify memory or 6502 registers, dump data to a printer and read/write to a disk and cassette without the use of DOS. Data is easily manipulated with the use of built in debuggers and disassemblers, single-step-through execution coding and even assembly code. Both Omnimon and Ultimon! reside in an unused 4K block of memory starting at $C000-$CFFF (49152-53247), which is an area



Picture 2

Picture 3

rumoured by Atari to have been earmarked for future expansion, such as enhanced graphics capabilities and 192K of on board RAM (something which is now quite dated since the Claus Buchholz 256K 800/XL/XE modification in the Documented Public Domain). All 'invisible' features such as Cassette Baud rate and Port 1/2 echoes (1 echoes 3, 2 echoes 4 – programs using sockets 3 and 4 will now work off of port 1 and 2 on the XL/XE) are initialised on the cold start power-up process, as is the new character set on Ultimon! The monitor area of each program has to be activated manually by the user. Ultimon!, unlike Omnimon, has the ability to jump straight into the Monitor on power-up whilst over-riding the Cartridge initialisation process of the computer, allowing one to examine the coding in the

Contained Feature	Omnimon	Ultimon!
Single/Dual/Double Density Link	Yes	Yes
Screen Tabbing In/Out	No	Yes
Boot disk to linked drive	Yes	No
Print Screen	Yes	Yes
Toggle screen format (Hex/ASCII)	Yes	Yes
Assemble Code	Yes	No
Enhanced Character Set	No	Yes
Disk Directory	Yes	No
Support D1: through D4:	Yes	Yes
Alter Memory location contents	Yes	Yes
Breakpoint set	No	Yes
Compare two blocks of memory	Yes	Yes
Disassemble memory	Yes	Yes
Examine memory contents	Yes	Yes
Format Disk	No	Yes
Go at address	Yes	Yes
Fill memory	No	Yes
Go at program counter	No	Yes
Basic Interpreter On/Off	No	Yes
Jump to subroutine at address	Yes	Yes
Jump to subroutine at Program Counter	No	Yes
Locate string of bytes	Yes	Yes
Alter processor Status Register	Yes	Yes
Quit	Yes	Yes
Read from linked device	Yes	Yes
Write to linked device	Yes	Yes
Read Binary file	Yes	No
One byte read	No	Yes
Push Stack	Yes	Yes
Pop Stack	Yes	Yes
Trace through memory	Yes	Yes
Super Cartridge On/Off	No	Yes
Single step	Yes	Yes
Boot ignoring Cass/Disk/Cartridge	No	Yes
Complete Error reporting system	No	No
Display CPU registers	Yes	Yes
Complete status display screen	No	Yes
Display Binary Load Vectors	Yes	No
With RAMROD/TRIPLER	$79.95	£69.95
Without RAMROD/TRIPLER	$49.95	£49.95
Computer Support (UK) Ltd 26 Seacourt Road Abbey Wood London SE2 9UW	CDY Consulting 421 Hanbee Richardson Tx 75080 USA	

Figure 1. Ultimon! XL/XE & Omnimon XL/XE comparison chart

cartridge area of memory $A000-$BFFF (40960-49151). The over-riding of cassette and disk boot processes can also be achieved equally as well, allowing further instant investigation.

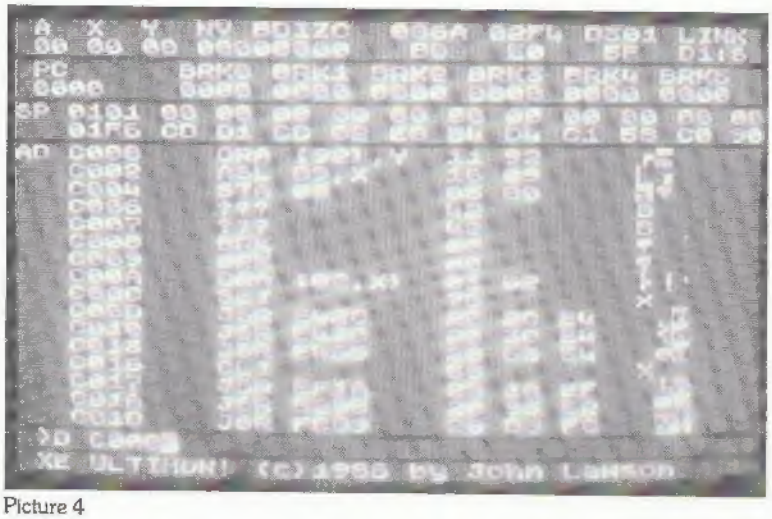
Figure 1 shows many of the features held within each Operating Systems environment, however giving precise details on them all and their special functions for each OS, would take some time and space. Each OS has its own functions unique to itself and it is these, together with the more complex and more commonly used functions of each monitor which I intend to go into and give a brief overview of each.

Ultimon! XL/XE

Screen Tabbing is a feature unique to Ultimon! and enables the user to Tab in and out of screens. Once a program has been interrupted and Ultimon! has been entered, one can tab back to your program screen and still command Ultimon! Only the display screen and vectored interrupts will be running, not actually the program, allowing Ultimon!'s built-in screen dump program to dump your program screen to your printer once you have tabbed into it. The Disassembly feature in Ultimon! (see Picture 4) is far superior to that of Omnimon, and was written by Paul Carr of Futureware and is capable of disassembling memory into standard MOS technology (designers of the 6502 chip) opcodes. Format for disassembly displays the Address of the Opcode, the interpretation of the Opcode, the bytes which form a particular Opcode and the ATASCII interpretation of the bytes. Disassembly of memory is fast and clear and allows the user to page through memory, disassembling code as you go.

When you turn off the Basic Interpreter built into your XL/XE with the use of Ultimon!'s special Interpreter function, you can move Ultimon! itself up into the previously reserved area, to achieve special functions which couldn't previously be obtained due to lack of space, and then turn the Interpreter on again when your operation has been completed. Optimized Systems Software (OSS) BASIC XL/XE (Basic programming languages far superior to that of Atari Basic), MAC/65 (The most efficient Assembler ever made for the Atari 8-bit computers) and ACTION! (One of the most satisfying and fastest programming languages for the Atari 8-bit computers) can also be switched in and out directly from Ultimon!'s main operations screen.

Locating a string of bytes is a simple task with Ultimon! and is achieved by



Picture 4

specifying a range to search in memory and the group of bytes to be searched for within that address range. Moving a block of memory to a safe area is also easy – specify your start and end locations and the desired position in free memory you want to place your block, and within seconds the entire block is copied to its new location and if necessary the old block filled with zeros or any other byte which can be called using Ultimon!'s fill memory command. The Trace function in Ultimon! allows the user to single-step through the disassembly following each step in code as it would be executed. The Display update mode in Ultimon! will continue sampling the same area of memory until stopped and so allows the user to examine a memory location and see if it is being updated during VBI's.

Linking of devices to specified formats is easy; Single, Dual and True Double density can be read and written to the disk from drive D1: through D4:. Serial I/O can also be directed to disk or cassette and can handle 128 byte or 256 byte transfers. Quitting out of Ultimon! can also be directed to ROM, Disk, or Cassette (Zero bytes in DOSVEV, DOSINI, CARTAD and CASINI will result in a system lockup). The screen dump function is fast and works on the Ultimon! screen and the screen Tabbed out to by the user.

Omnimon XL/XE

Omnimons display screen displays data in Hexadecimal or Character format (toggle each on and off). In character format the data is displayed as one or more lines of 24 byte character strings, while in Hex format the data is displayed as one or more lines of 8 hex bytes separated by a standard space. The disassembler works in a similar way and displays data in character and hex format and can also translate 6502 assembly language into machine code. Omnimon's disassembly routine is noticeably less clear than Ultimon!'s, and so appears to be less professional. The assembler in Omnimon is not a full two pass assembler, but will immediately assemble any inputted single line assembly language coding into machine code saving the time and effort of leaving Omnimon to go to your assembler editor for a long and tedious assembly operation. Once the assembler has been entered the address in Hex is entered followed by the instruction which must be legal in 6502 language. Branch instructions (BNE, BEQ, etc.) are handled within the assembler quite easily while the operand is specified as an absolute address, leaving the assembler to calculate for you the displacement figure, preceded by a '+' or '–'.

Omnimon, like Ultimon!, has a single-step feature too but it is called Execute Memory. This command, as in Ultimon!, causes the instruction pointed to by the Program Counter to be executed, the registers are then displayed together with the next instruction to be executed. Omnimon's single-step feature does have one major drawback, which I've found to be wrong in reporting status only once, and occurs when an SEI command is encountered. For some reason, Omnimon's single-step cannot step through this instruction and requires a BRK (0) instruction to be placed at the end of the CLI instruction,

which does the job of single stepping better, but still confuses itself and regains control after the BRK instruction has executed.

Omnimon's Verify command (and Ultimon!'s Compare command) is a powerful feature and can display differences between two pre-selected blocks of memory, which can then be changed, saved or printed out (Omnimon's hardcopy option runs on a toggle system, and toggles from the screen to the printer at the press of a key and sends all data, to which ever output device is selected). Ultimon!'s compare command splits the screen and displays each part of memory where differences have been found, allowing a hardcopy of the screen to be taken if necessary.

A feature lacking in Ultimon!, but available in Omnimon, is the Binary Load and Directory commands. Here, you can load any Binary File from a standard format Single or Double Density Atari 2.0S/2.5 compatible DOS Disk, which allows the Directory to be searched together with file size and start/end sectors to be printed out. Also contained in this feature is the ability to examine the Binary Load vectors of loaded file and direct the binary program to an address in memory previously selected. At this stage, when the file has been loaded and the load and initialisation bytes have been created, a boot disk can be made.

A feature powerful to Omnimon is the Jump Subroutine Command. The JSR command allows the execution of a subroutine which, once executed, will return control to Omnimon and so can be easily used to test out routines during development. This feature also permits direct jumps to Operating System locations and so can be used to call direct responses otherwise only controllable out of Omnimon and under a Disk Operating System, but should be used with care as system locks will result if the wrong location has been jumped to!

The Products

Ultimon! with its TRIPLER board by John Lawson and Omnimon with its RAMROD board by David Young, are both solidly built products. Time and effort has undoubtedly gone into developing and researching the final products which is noticeable just by looking at the professionalism used. For a first major utility, manufacturing company Computer Support has done a fantastic job in capturing a market very sparsely catered for here in the U.K.

Any serious programmer should not be without such a powerful addition to his Atari computer. Being able to freeze a program on the fly and debug it instantly and rerun it again as if it were not stopped is without doubt the best and easiest way to remove bugs from programs you are developing. I know many professional programmers who swear by both products, and find all commands and features more than valuable. Even if you are not an experienced programmer, a resident monitor will help you understand the inside of your computer and help you on the road to understanding 6502 Machine Code. True controlling power over your Atari is now available.

MORE JOY FROM NEW STICKS

Two new joysticks have just appeared on the market. The first is the 500XJ from Epyx, claimed to be the first high-performance joystick. It has been specially designed to fit in the palm of the hand for easier, more comfortable handling. A shorter, faster and more precise 'throw' is a feature aimed at getting those elusive milion scores. The trigger lies under the body and lays along your trigger finger, where it always should have been, and this gives a lightning speed reaction time. It also means that you squeeze to fire rather than push a button, and this is a much more relaxed action allowing you to last longer before tiring. Another interesting feature are unique shaft switches which click as you move the stick so you can not only feel, but hear each move you make.

The second stick is the Magnum from Mastertronic which has abandoned mechanical switching in favour of electronic micro-switches. Other features include a free-floating activator ensuring smooth play-action, rapid-fire hair-trigger with a sensitive 1.5mm movement, 6 feet of connecting cable and left or right hand usage.

THE PRICE OF MAGIK

Cassette £9.99, 64K.

The masters of the adventure game, LEVEL 9, have come up trumps yet again, with a superb follow-up to RED MOON, called THE PRICE OF MAGIK.

Once you have loaded the game (how I hate cassettes) you take on the guise of Scorcerers Apprentice to the Supreme Wizard. With over 200 illustrated locations your task is to save humanity from the evil magician who is exploiting the Red Moon crystal. If you have played RED MOON you will understand the importance of the crystal.

By entering a mansion and using your magical powers to outwit the unscrupulous magician, your progression through the screens is by no means easy. Learning the spells and using the correct 'key' to operate each spell helps, but the spells alone cannot answer your problems — sometimes aimless wandering around and casting spells just to see what happens, can be effective but takes time; the real challenge is to develop your own magical skills and study the hints given in detail, particularly when you are near the crystal.

However, you still have to contend with the wandering independent monsters who not only talk to you but also want to fight. By solving puzzles on the way, you can take the weapons and armour to be found in the mansion, but your best means of combat is magic orientated!

The witty responses from the program are always fun in any adventure game and this one is no exception. It's challenging and extremely enjoyable to play. Even the most hardended adventurer will be occupied for a very long time.

Needless to say, as expected from LEVEL 9, there is an ever increasing use of vocabulary and very good graphics. They have definitely got another hit on their hands.

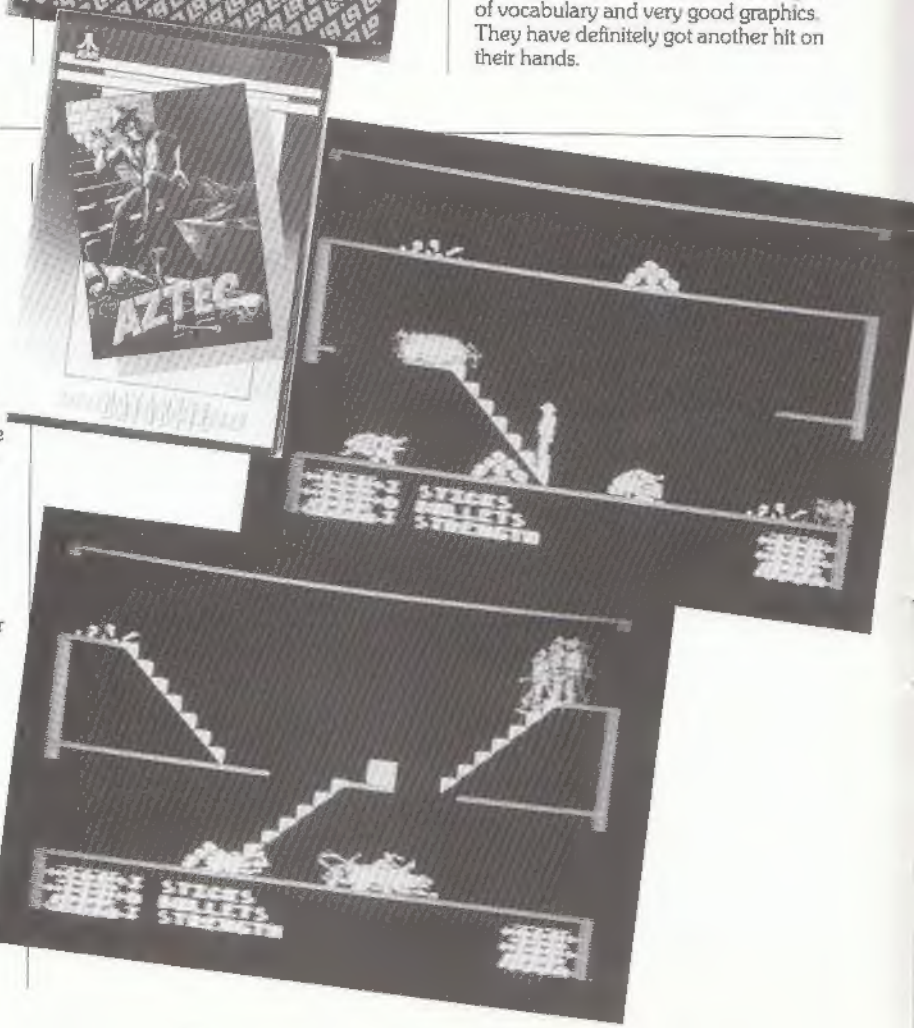
AZTEC

Disk £12.95, Cassette £8.95, from Databyte.

This is the answer to RAIDERS OF THE LAST ARK, a platform game, but with difference. The golden idol is hidden in the lost pyramid, and an eccentric archaeologist has never returned after locating the temple, your quest is to trace the Professors footsteps and discover the AZTEC pyramid. There are many deadly traps, some thought to have been set by the jealous Professor.

Each game has eight floors of eight rooms, which in turn have three levels. Start at the lowest level and hopefully progress as you get better. You can crawl, jump and climb, search through rubbish for clues, avoid snakes and other such monsters, you can also fight with a gun or knife and hopefully, eventually find the golden idol and escape.

One of the better platform games around at the moment, excellent graphics and not too easy, interest is kept because of the changing scenery.



NUCLEAR NICK

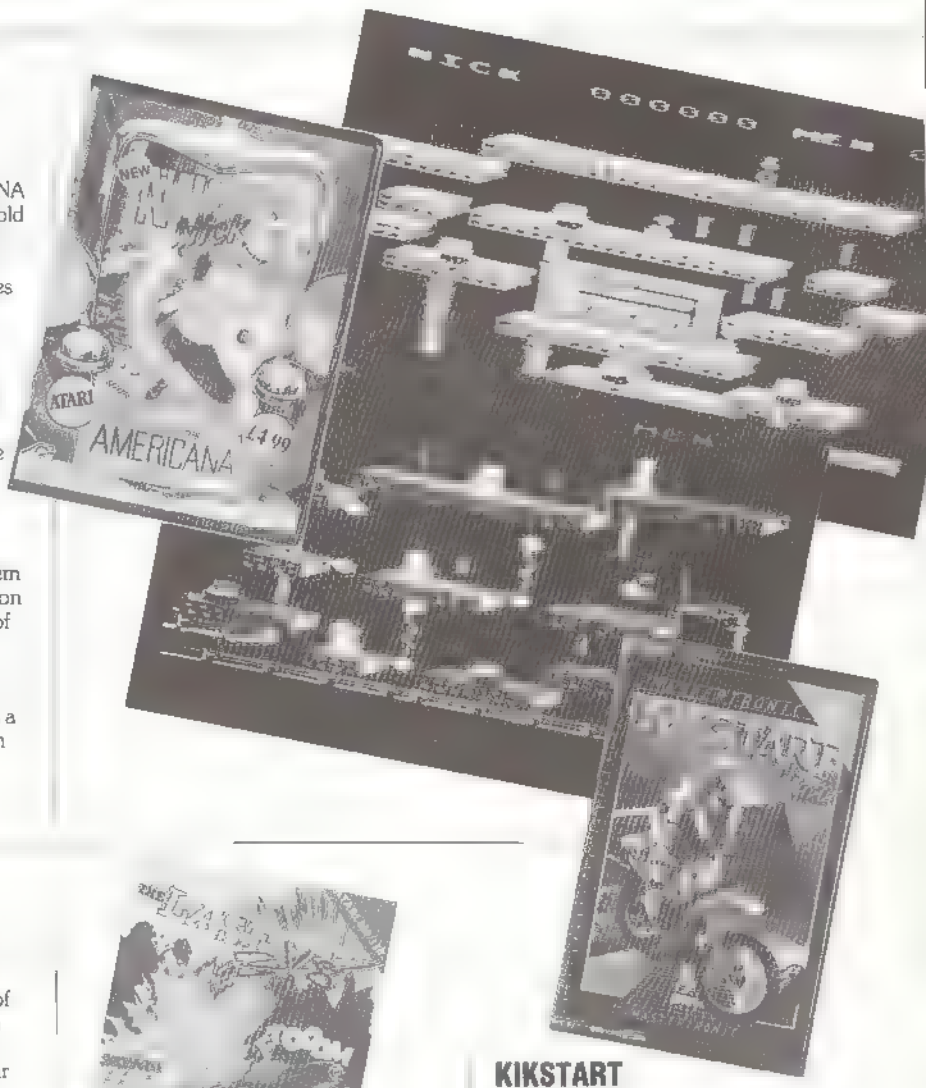
Disk £4.99, Cassette £2.99, 48K.

A game just released by AMERICANA SOFTWARE — an associate of US Gold I hasten to add. Do they use the same postperson? However, back to the game. One of the cheaper DISK games on the market at £4.99 which is encouraging.

Robots, elevators, laser walls, high wire obstacles are all there to hinder NICK from clearing the nuclear waste left by the malfunctioning robots otherwise he will be vapourised by the killer robots if he doesn't reach an energiser for extra power.

There are 20 screens, and like all platform games, you cannot be too complacent — games like this one seem to be very popular, so there is no reason why this one cannot stretch the skills of even the hardened games player.

If we all keep buying these cheaper games, perhaps the 'giants' in the software world will realise that there is a limit to how much any one person can spend, or is allowed to spend, on computer software.



THE LAST V8

Cassette, £2.99, from Mastertronic.

The first impression of this game is that it is yet another 'race track' type of game but wait, there is more to it than meets the eye. Having secretly developed a super car whilst a Nuclear War was going on, you emerge from your underground base to search for survivors — only to find an unexploded bomb. By using the dials, which are depicted on half the screen, helping or hindering you, as the case may be, your troubles begin. You only have a limited amount of fuel as well as a radiation shield to help you, the shield looses its effectiveness if you are too long, you only have seconds to return to base — it is not easy driving the car — speed is important but it is all too easy to crash, even expert joystick handlers will find it difficult!

It is an enjoyable game even if it is sometimes on the impossible side. The graphics are good and the scrolling screens are quite smooth and fast. At the ridiculous price of £2.99, how can you go wrong.

KIKSTART

Cassette, £1.99, from Mastertronic.

Having been an avid 'Kickstart' watcher on T.V. the thought of playing this game didn't impress me at all, however, it certainly does have a fun element about it, even if it's only in the way I fall off the bike, varied but very numerous!

The game starts off slowly and at first seems quite easy but the various obstacles which have to be negotiated as quickly as possible, get a little more tricky. The game can become frustrating but on the whole with a steady hand you can become as good as any of the celebrated kickstarters — yet another good game to add to your collection. Nice to see a game for 2 players too — saves a lot of arguments.

ONE MAN AND HIS DROID

Cassette, £1.99, from Mastertronic.

First impression was music (XL/XE only) good, graphics acceptable. Having arrived at the Planet Andromadous with your faithful companion, in the shape of a Droid, your task is to capture Ramboids (male sheep would you believe). Each Ramboid has to be transported back to Earth in the time allotted. Like sheep these beasts have minds of their own and only move to a particular pattern which can be remembered after a few trials. When you've netted your 4 or more Ramboids in the correct order you can then progress to the next cavern with the aid of a password. A split screen also aids your progress.

There are 20 caverns and umpteen Ramboids to drive, so tunnel correctly and you will succeed. It is a novel idea which is, after all, fun to play — again great value for money.

ATARI PLANETARIUM

Reviewed by Joseph S. Kennedy.
Reprinted from JACG.

Wow! That just about sums it up. Atari has hit the jackpot with their new program, ATARI Planetarium. This program allows you to do things that you couldn't experience without a computer. It also allows you to do things that would have taken you a lot longer to learn without the program. The best way to start describing ATARI Planetarium (AP) is to give a brief outline of how you start the program. First, you must have an XL or XE, as the program requires at least 64K. Boot the program with Basic, after the program is loaded flip the disk over, as the reverse side has all the data on the astronomical objects. Next you must enter the latitude and longitude of the spot from which you wish to view the sky. The program provides a map of the world, and you just move the cursor with the joystick to that site. I found, however, that it was easier to simply move the site data with the arrow keys to the proper latitude and longitude (which was determined before hand from a road map). After entering the site data you must enter the time at which you want to see the sky. Here's where AP begins to shine, you can enter any date and time from 9999 BC to 9999 AD. The program automatically adjusts the calendar according to the year selected (including those elusive ten days in October 1582 AD). After entering these parameters you are ready to look at the sky.

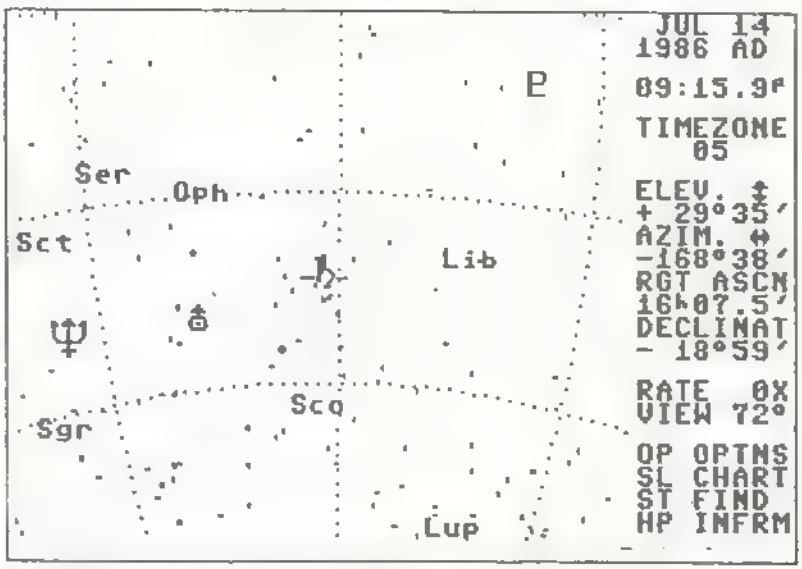


Figure 1.

When viewing the sky you have many options to choose from. You can have the constellations named. You can have lines connecting the stars of a constellation. You can have deep sky objects displayed, if you want. You can even have the symbols for the various planets displayed. The field of view defaults at a 72 degree angle (the widest available) but you can easily change it to as narrow as 9 degrees if you wish. For comparison, the Big Dipper is about 25 degrees in width, thus at the narrowest setting you could see less than one-half of the Big Dipper.

More importantly, you need to know what you're looking at; so just centre the cursor over the object in question, and press the HELP key for a brief description of the solar system, 88 constellations, over 1200 stars and over 300 deep sky objects. You can also have AP locate these objects for you if you wish by pressing the START key.

One potential problem is that my extension cords do not reach to the spot in the yard where I use my telescope. But AP comes to the rescue again. You can print out any screen by pressing CONTROL P for Epson printers or SHIFT P for the XM801 printer. (My Panasonic KXP 1090 which is supposed to be Epson compatible gave an extra line feed with each line in the Epson mode but printed just fine as an XM801.) When printing out the sky for backyard viewing the Chart option comes in handy. With the chart option you can print out personalised star charts for your location, with time of viewing complete with right ascension and declination lines for reference (see Figure 1). With these charts I was able to locate Saturn and Uranus in my telescope in just a very few minutes.

But wait, AP is more than just an aid for the backyard astronomer! (That's right folks, with each order a free set of steak knives). As I mentioned above you can look at the sky at any time between 9999 BC and 9999 AD. By setting various dates you can see astronomical phenomena that no living person will ever see in one lifetime, such as the changing of the pole star due to the earth's precession (see Figures 2 and 3). You can view past eclipses or preview predicted ones.

As in all love affairs (and I think that this is truly a case of love at first sight between me and my AP), there are some rough spots. The first is upon booting up. AP is written at least in part in BASIC but nowhere in the manual is this mentioned, so naturally I held down the OPTION key when I first booted up. It took a few tries before I realised what had happened. Secondly, nowhere in the manual does it tell you that you cannot have anything plugged into joystick port two. It took several tries before I realized that my Koala pad in port two was causing a problem. Thirdly, the printer driver does not always recognize that your printer is ready and waiting. When this happens you must continually hit the RESET button then the SHIFT P until the program recognises your printer. I also experienced my first printer time out (even though I'm using a Panasonic printer). But my biggest gripe is that the authors of the program did not allow for resetting the default parameters of location and time at the start of the program. It is annoying, to say the least, to have to change the site parameters and date (including year) each time one boots up. I hope that a good sector editor will allow for at least a change of the defaults for the site. But now that the gripes are out of the way, read the next paragraph.

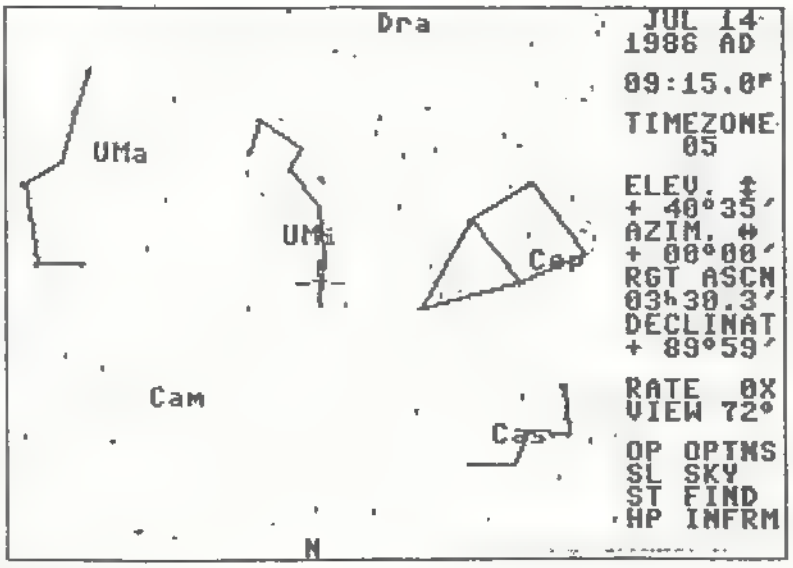


Figure 2.

The ATARI Planetarium is one of the reasons I bought my Atari four years ago. No that's not as strange as it sounds. I bought the computer to do things I couldn't do without it. AP is a perfect example of a program that allows you to do things you couldn't do without a computer. look into the future and the past, or prepare personalised star charts on a daily basis. Let's give Atari credit for giving us good quality for the price. And let's hope to see more of the same from Sunnyvale in the future. Thanks ATARI for a great product!

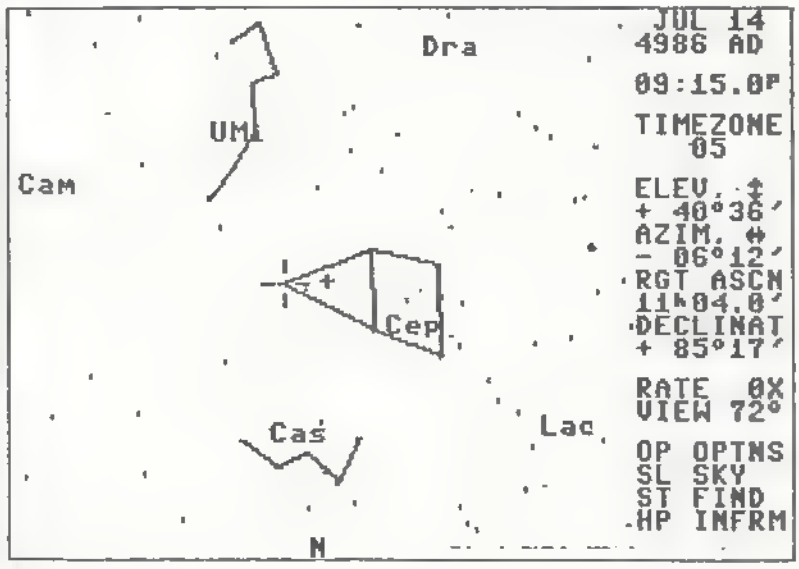


Figure 3.

Adventure into the ATARI

by Steve Hillen

Part 2 in writing your own adventure.

Last time I developed a complete adventure system which although being small, could be enlarged to create quite a long game. But what happens if it becomes too long, and you run out of memory? This time, I will discuss a few ideas for saving memory.

So how do adventure games, such as Zork and Snowball, have so many very long room descriptions and not run out of memory? A complete screen of normal text will occupy almost 1K of memory, so what with the actual program, surely only about 30 such screens of text are possible. Zork 'cheats' slightly by accessing a disk, but even so the amount of text contained in the game would still not fit on a disk in its normal format.

Most commercial games nowadays use some sort of data compression techniques to reduce the memory required to contain the large sections of prose. However, there is a trade off because this compressed text cannot be printed directly – instead a special program must be written in order to decode the compressed text and then print it. In general, the larger the game, the more efficient the compression technique will be.

Infocom games, such as Zork, are written in Z code which is a subset of MDL, the language in which Zork was originally written. Each game they write has two basic parts – the ZIP or Zork Interpretive Program, and the actual game data. For this article, the part we are interested in is the game data, especially the Z-code strings. These are where all the text used in the game is stored. The method Zork uses to save memory is to make each character occupy just 5 bits instead of 8. This means that 3 characters can fit into 2 bytes, a considerable improvement. If you've been thinking, though, you will realize that with 26 letters, 10 numbers, and punctuation marks, far more than 2^5 or 32 characters are needed. The Z-code solution to this is to reserve 1 or more characters for switching between different sets of 32 characters. Zork uses 3 sets of 32 characters, for upper case, lower case, and numbers/punctuation. The switches between sets lasts permanently or just for the next character, e.g. to force a capital letter at the start of a sentence.

Because of these context characters, Z-code strings occupy about 5.5 bits per character. This is a pretty sophisticated compression technique and also quite effective. It also has the advantage of making the compressed strings quite unreadable so that cheats can't examine the actual code for clues. (Damn!)

Level 9 use a quite different technique, which is a lot more easily understood. They take the most frequently occurring words and replace them by a single special character. When the compressed string has to be printed, the string is printed out as normal except where a special character is found. This character is referenced in a look-up table, and the corresponding actual word is then printed out.

Again there is a certain overhead, but the more times a commonly used word is used, the more memory will be saved.

Well, enough waffle – how is data compression useful to us? Those of you with 16K machines will know how quickly the memory is filled by text, and 48/64K machines don't take a whole lot longer to run out of memory.

This next section contains a program which uses a data compression technique very similar to that of Level 9. The procedure to use this program is as follows.

Group together all of the most commonly used words in your adventure (up to 128 altogether), and put them into the string CC$ in the following manner:

e.g. for the words OK, wall, west, east, large

CC$="AOK Bwall Cwest Deast Elarge E"

Each word in the string is preceeded by a special code character that represents that word. It is *always* an inverse character. There are only 128 inverse characters so you can only compress up to 128 words. Note that after each word is a punctuation mark or space. These are included here to further save space.

Finally, at the end of the string, after the last word, put an inverse character – it does not matter if it has been used before. Unfortunately, this method also means that you cannot use inverse characters within a compressed word, but this is not a major limitation and it would be possible to work round it.

Obviously, text within the program can now be written in the compressed form, i.e.

?"To the west is a large wall"

becomes

T$="To the Cis a EB"

which is quite a large saving.

Thus the text has been compressed, but the new string can no longer be printed out with the normal PRINT statement. The solution to this problem is to use a machine code subroutine (for speed and compactness) to do it for us. If T$ contains the actual text, and CC$ contains the list of compressed words and special symbols, then

XX=USR(1626,ADR(T$),LEN(T$),ADR(CC$))

will perform the expanded print operation for us. XX is just a variable not currently in use by the rest of the program. The machine code data statements, and an example of its use, are given in Listing 1. Line 200 completely replaces the line

?"To the west is a large wall"

Notice that the machine-code print statement is called by GOSUB PRT, where PRT is line 2. If this subroutine is kept near the top of your program, then printing strings will still work quickly and not be slowed down too much by the GOSUB statement. Obviously, the most memory saving will occur with the most commonly used words. The assembly language listing is Listing 2, for those interested. To make sure you understand how to use this compression routine, you could try and put the mini adventure from last time with this program. The two machine code routines are compatible, and it shouldn't be too difficult to put the two BASIC sections together.

Other methods for generally compressing BASIC programs are as follows:

1. Replace the most commonly used numbers by corresponding variables, e.g. C0=0 C1=1 C2=2 C10=10 C100=100 etc., so IF V=2 THEN becomes IF V=C2 THEN

```
LN 1 GOSUB 2700:GOTO 10
QS 2 XX=USR(1626,ADR(T$),LEN(T$),ADR(CC$)
   ):RETURN
AY 10 REM
QB 200 T$="To the Cis a EB":GOSUB PRT
VI 999 STOP
DY 2485 DATA 104,104,133,213,104,133,212,
   104,104,133,216,104,133,215,133,227,10
   4,133,214,133,226,160,0,132,224
YZ 2496 DATA 177,212,48,11,32,167,6,164,2
   24,200,198,216,208,240,96,160,0,166,22
   6,134,214,166,227,134,215
VN 2507 DATA 209,214,240,9,230,214,208,2,
   230,215,208,244,96,200,177,214,48,220,
   132,225,32,167,6,164,225
VP 2496 DATA 208,242,162,0,142,72,3,142,7
   3,3,160,11,140,66,3,76,B6,228
JH 2700 FOR A=1626 TO 1718:READ D:POKE A,
   D:NEXT A
FN 2710 DIM T$(120),CC$(200):PRT=2
CF 2720 CC$="AOk.Bwall Cwest Deast Elarge
   E"
AX 2730 RETURN
```

Listing 1. *In this program, anything which is underlined, should be entered in 'INVERSE'*

```
00010          .LI OFF
00020 ;Data de-compressor for
00030 ;AC in Monitor 13
00040 ;
00050 ;Storage:-
00060 ;
00070 STRING   .EQ $D4      Addr. of string
00080 CMPRES   .EQ $D6      Addr. of table
00090 LENSTR   .EQ $D8      Length of string
00100 TEMP     .EQ $E0      Storage
00110 STORE    .EQ $E1        "
00120 CCPRES   .EQ $E2
00130 ICBLL    .EQ $348     CIO control
00140 ICBLH    .EQ $349
00150 ICCMD    .EQ $342
00160 CIOV     .EQ $E456
00170 ;
00180          .OR $65A     After parser.
00190          .TF "D:MC.OBJ
00200 ;
00210 START    PLA          Discard
00220          PLA          Addr. of string
00230          STA STRING+1 to be printed.
00240          PLA
00250          STA STRING
00260          PLA
00270          PLA            Length of string
00280          STA LENSTR
00290          PLA            Addr. of table
00300          STA CMPRES+1   of decompressed
00310          STA CCPRES+1
00320          PLA            words.
00330          STA CMPRES
00340          STA CCPRES
00350 ;
00360          LDY #0         Print string
00370 LOOP     STY TEMP       one by one
00380          LDA (STRING),Y unless a special
00390          BMI SPECIAL    character
00400          JSR PRINT
00410 RESTRT   LDY TEMP
00420          INY            Done string yet?
00430          DEC LENSTR
00440          BNE LOOP
00450          RTS
00460 ;
00470 SPECIAL  LDY #0
00480          LDX CCPRES     Reset pointer
00490          STX CMPRES     to start of
00500          LDX CCPRES+1   table.
00510          STX CMPRES+1   look down
00520 SEARCH   CMP (CMPRES),Y table to find
00530          BEQ MATCH      special character
00540          INC CMPRES
00550          BNE SKIP
00560          INC CMPRES+1
00570 SKIP     BNE SEARCH
00580          RTS            No match so skip
00590 ;
00600 MATCH    INY            Just print from
00610          LDA (CMPRES),Y table now
00620          BMI RESTRT     until another
00630          STY STORE      special character
00640          JSR PRINT      arrives.
00650          LDY STORE
00660          BNE MATCH
00670 ;
00680 PRINT    LDX #0         Just get CIO
00690          STX ICBLL      to print one
00700          STX ICBLH      character.
00710          LDY #$0B
00720          STY ICCMD
00730          JMP CIOV
```

Listing 2.

This does actually save space because BASIC uses 6 bytes for each number, and only 2 for each variable. Obviously use this method for only the most frequently occurring numbers, otherwise you will run out of variables. Incidentally, this also speeds up execution of the program.

2 Replace IF V=0 by IF NOT V, and IF V<>0 by IF V.

Surprisingly, the statements mean the same, and it saves 6 bytes by omitting the zero.

3 From the last issue you will probably realize that the data for M$, the master location string, is included twice, once in numeric form within the program listing, lines 2300-2307, and again as characters within the string. This is very wasteful, and it would be better to write the data in just once.

One idea would be to write a separate program that read all the numerical data into a string and then saved the string out to disk or cassette. The actual adventure would then just dimension the string and read it back off the disk or cassette.

A slightly less efficient, but probably easier solution is as follows. Write a separate program that reads in all the numerical data into a string and then print out that string in sections so that each section can be made into a line within the program. Listing 3 shows an example of this. Type it in, and run it. The numerical room data will be converted into a series of lines, each containing part of the master string, M$. If you run the cursor over these lines and press RETURN then they will be entered into memory, and you can then dispose of all the numeric statements.

4 Finally, try and stuff as many statements on each line. It looks messier, but again it saves memory.

Well, I hope that someone will find that these compression routines are of some use. I would suggest that you write the adventure first without using the text compression and get it working. Then descriptions can be worked out, and the most common words grouped together to form CC$.

Next time I shall move on to discuss either a proper sentence-analysing parser, or how to spruce up the game display. Please write in if you have any suggestions, queries, (or even complaints).

```
BD 10 POKE 195,0:TRAP 30:X=0:LINE=990:DIM
   M$(30)
TZ 15 IF PEEK(195)=6 THEN END
UF 20 FOR A=1 TO 30:READ D:M$(A,A)=CHR$(D
   ):NEXT A
ZG 30 LINE=LINE+10
IT 40 ? LINE;" M$(";X*30+1;",";X*30+A-1;"
   )=";CHR$(34);M$(1,A-1);CHR$(34):X=X+1
TK 50 GOTO 15
QQ 99 REM Room data
AX 100 DATA 0,0,0,0,0,0
BA 101 DATA 0,0,0,0,0,0
DF 102 DATA 0,3,0,0,1,0
IM 103 DATA 2,0,4,7,0,0
FX 104 DATA 0,0,5,3,0,0
BM 105 DATA 0,0,0,0,0,0
DD 106 DATA 4,0,0,0,0,0
DI 107 DATA 0,0,3,0,0,0
```

Listing 3.

GRAPHICS 8 PAGE FLIPPER

by STEVEN HILLEN

Yes. I'm afraid it's true. This is yet another Graphics 8 utility for use with BASIC. This one eats up a massive 16K of screen RAM, so you will need at least 32K to RUN it.

Have you ever drawn a little man in Graphics 8 and suddenly decided to animate him? Yes, you all do, but the trouble is that before you draw the man in the new position, you must get rid of the old one. However you do this, whether it's by 'unplotting' the old man or just by erasing the whole screen with another call of Gr.8, you will invariably cause a short time when there is no man at all on the screen, and worse, a time when it is being redrawn. These tacky sights will ruin an otherwise convincing and impressive demo.

So, the cure for the delay is to use PAGE FLIPPER! This short machine code routine sets up a second Graphics 8 screen directly below the Operating System normal screen. As the OS displays one screen, your PLOT and DRAWTO commands are affecting the hidden one. Once you have finished drawing, the routine swaps the two screens, freeing the first one for drawing while the most recently drawn screen is displayed. Also, the routine erases the screen you are about to draw on, so you needn't fiddle about with unplotting.

There are 2 listings with this article. Listing 1 is the BASIC code which you can type in. It contains the machine-code routine in DATA statements which is then moved into a string. It also contains a small demo which shows a diamond growing in size without visibly being redrawn. Type it in using KEYO, or if you're not using the checksum program, just ignore the two letters preceding each line number.

Listing 2 is the source code for those of you interested in seeing how the routine works. You do NOT have to type this one in. It is a very short routine that works by placing alternate screen addresses in SAVMSC (the OS screen pointer) and the LMS operands of the display list.

To use PAGE FLIPPER in your own routines, copy across the DATA statements and call the routine with X=USR(ADR(SCREEN$),N) where N is 0 or 1 depending on which screen you want to access.

So, you have no excuse not to write a top-notch animation sequence. Keep your eyes peeled for yet more Graphics 8 utilities in the future.

Listing 1

```
JM 0 ? CHR$(125):LIST 120,260
DO 10 IF PEEK(53279)<>6 THEN 10
LG 20 DIM SCREEN$(63):REM Dimension strin
   g to hold the machine-code
EJ 30 FOR STRINGREAD=1 TO 63
KN 40 READ DATA
LY 50 SCREEN$(STRINGREAD)=CHR$(DATA)
FN 60 NEXT STRINGREAD
BS 70 REM This sets up the machine-code
UK 80 DATA 104,104,104,41,1,170,173,48,2,
   133,203,173,49,2,133,204,165,89,160,5,
   145,203,160,101,24,105
TH 90 DATA 15,145,203,169,32,224,0,208,2,
   169,224,24,101,89,133,89,133,204,164,8
   8,162,31,169,0,133
TH 100 DATA 203,145,203,200,208,251,230,2
   04,202,208,246,96
QQ 120 REM
LS 130 REM Instructions for use
RA 140 REM --------------------
VN 150 REM Call graphics 8 first
NO 160 REM Set colours
GV 170 REM Call X=USR(ADR(SCREEN$),N)
ND 180 REM where N=0 or N=1
RR 190 REM Draw picture in hidden
DX 200 REM area using plot & drawto
MR 210 REM as normal, then call
YH 220 REM X=USR(ADR(SCREEN$),NOT N)
QT 230 REM
VF 240 REM ****DEMO PROGRAMME****
PG 250 REM ----------------------
EN 260 REM PRESS START
NJ 270 GRAPHICS 8+16:SETCOLOR 2,0,0:COLOR
   1:SETCOLOR 1,0,15
2G 280 SIZE=10
UT 290 X=USR(ADR(SCREEN$),0)
JJ 300 SIZE=SIZE+2
BI 310 PLOT 160,96-SIZE:DRAWTO 160+SIZE,9
   6:DRAWTO 160,96+SIZE:DRAWTO 160-SIZE,9
   6:DRAWTO 160,96-SIZE:REM Diamond
VE 320 X=USR(ADR(SCREEN$),1)
UP 330 SIZE=SIZE+2
BQ 340 PLOT 160,96-SIZE:DRAWTO 160+SIZE,9
   6:DRAWTO 160,96+SIZE:DRAWTO 160-SIZE,9
   6:DRAWTO 160,96-SIZE:REM Diamond
PF 350 IF SIZE<90 THEN 290:REM Loop back
```

Continued on page 22

GRAPHICS 8 PAGE FLIPPER

CARDS

Reviewed by Michael Stringer

This compendium of card games is really good. There are five games included in the package, all under GEM and mouse control. Changing from one game to the next only requires the menu to be touched and they are all available on the drop down menu. Under the OPTION menu are options corresponding to certain features associated with the games – such as RE DEAL 1 and 2 which are shadowed until available. The games are BLACKJACK (Pontoon), CRIBBAGE, POKER SQUARES, SOLITAIRE and KLONDYKE. Klondyke and Solitaire are well known patience games, but unfortunately for some reason the rules to KLONDYKE were omitted from the instruction manual. If this game is unfamiliar, I will give you a very brief outline. The colours are alternated and cards are added in descending order. Aces are placed to one side and their suites are built up in ascending order. If gaps occur in the columns to the right of the Aces, Kings and any cards on his pile can be transferred across. The objective is to build all the suites up on the Aces. Card movement is by 'clicking' or 'dragging'. Cards are clicked from the stock pile onto the discard pile. Aces are clicked when they are seen which moves them automatically to their reserved boxes. Similarly, two's, three's, etc. are clicked when they can be moved. All other moves are by dragging – Kings are dragged to boxes when available and the selection of other cards from the discard pile and within the main playing area. 5 points are awarded for each card placed in the reserved area. My best score to date is Green 364. SOLITAIRE is a very addictive game. Aces are removed from the field of action when they appear and then the suits are built up. Cards are moved according to their suit, spades to spades, clubs to clubs etc. and in descending order. But there is a catch: only one card can be moved. For example, a 6 of spades can be moved to a 7 of spades but a pair 6 and 7 spades cannot be moved to the 8 of spades. Any card behind a King is blocked. To help out, two Re-deals are available. POKER SQUARES is a card game requiring great skill and concentration to be successful. The field of action is a grid of cards laid out in five columns containing five rows. Your task is to build up the best poker hands, from a random deck. Each card has to be placed on the grid with care, remember

the hands are horizontal and vertical. BLACKJACK (Pontoon) is such a well known game there is no need for further description. My best score is 224. CRIBBAGE is also a well known game, but this version is tough! All the other games in the compendium play fairly, you can win. In the game of Cribbage, it only lets you win occasionally: perhaps one game in twenty. If you want to play against some of the finest Cribbage hands you will ever see, then this is the game for you! Just for the hell of it, I kept a check of six consecutive hands dealt to the computer, by the computer. The card in brackets indicates the card cut for joint use. 7 7 8 8 (8) A, 2, 3, 3 (2), 9 8, 7 6 (8), A, K, K, 4 (K), K, Q, 10, 5 (10), 6, 5 4, 4 (7). Remember, I had no idea what was to be dealt and also, these hands were consecutive. In a couple of hours I have seen hands that one might come across once in a blue moon, not hand after hand. Two consecutive hands had a 26 point count!! What does this prove? Only that the programmer plays a good game of cards, and possibly cheats, you cannot use your skill in trying to beat the computer, as you can in the others. The games will run in medium resolution colour or monochrome. The quality of the graphics is superb, crisp clear and it is more enjoyable playing the games in colour than in monochrome. I believe this is the first example of a compendium written in 80 column colour. At £19.95, this is by far the best games package from MICRODEAL. It will provide many, many hours of addictive enjoyment.

Hacker

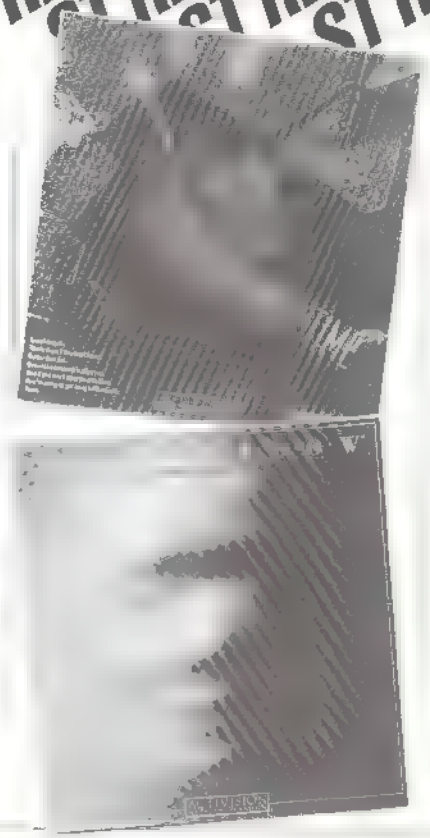
Reviews by Michael Stringer

This illustrated text adventure was devised by Steve Cartwright and what an evil minded person he is! This game has been around on other machines for some time now, and is now released on the ST. It can be run on either a monochrome or colour monitor. The packaging is typically smart and practical as one has come to expect from ACTIVISION. The manual has a couple of surprises too. As the title implies, you have 'hacked' (in true computer lingo) into a computer system and you are very much on your own. It is divided into a number of phases, about which I will not go any further.

You are the controller of a little robot travelling around the world with the task of retrieving portions of a stolen document. The graphics are really good and you should spend some time admiring the local scenery, not too long, otherwise the spy satellites will detect you! This is a fascinating game: it is clever and very, very spiteful. I am deliberately keeping this short in order that I do not give much in the way of clues away. The current price is £24.99 and is good value for money for such a great adventure. It is time to Log On please.

Borrowed Time

This is another illustrated text adventure again for either monitor system, written by Interplay Productions It is a two disk program again very attractively packaged from ACTIVISION this time with normal documentation'' This game is remarkably similar to a very popular game on another micro under the title of 'Deja-vu It has an enormous almost cult following with them and I can see the same thing happening to ST adventurists You are a 'private eye and your task is to prevent a murder — your own!' The suspense is quite amazing, you will be shot at (frequently) torn to little pieces by nasty bow-wows burned, the victim of frequent grievous bodily harm and so on, and so on Brilliantly devised this game will rank as one of the best, most impressive and enjoyable and priced at £24 99



Mindshadow

This illustrated text adventure is also from Interplay Productions, again first-class presentation on two disks from ACTIVISION also retails at £24 99 Your task is to find out who you are' Suffering from amnesia, you awake to find yourself washed up on a tropical island beach Using the mouse, which is common to all these ACTIVISION products under review, you can quickly assemble questions and get around easily You have to *think* a great deal of the time, but it is well worth the effort Sometimes your thoughts are successful, but at other times it s not so This is another brilliantly conceived game suitable for colour or monochrome with excellent graphics and many surprises. Most captivating.

Cornerman

Reviewed by Keith Mayhew

If you have been collecting desk accessories for your ST, then you have probably got to the stage where there are too many accessories to have loaded at once This is because GEM will only allow up to six accessory names to be entered in the desk menu Each ' ACC' file loaded can of course contain more than one accessory and make the appropriate entries in the desk menu however the grand total is still limited to six entries

Cornerman, from Microdeal, attempts to overcome this problem by offering ten desk accessories in just one accessory file Once the machine is booted with Cornerman one entry is made on the desk menu and a clock appears at the top right of the screen in the menu bar The clock is updated every two seconds but this occasionally occurs with an annoying flash A minor problem is that the updating will stop if no windows are open on the desk top.

Selecting Cornerman from the desk menu causes a small window to appear with the ten accessories listed Also displayed is another clock and the full date including the day of the week Choosing one of these accessories removes this window and creates another with the accessory running in it. This process can be repeated to have several accessories available at any one time each in its own window

The accessories available are as follows.

1 A useful ASCII chart showing the character its ASCII description (if it is a control character) and its decimal and hex value.
2 A calculator which can operate in binary octal, decimal or hex. A 'paper tape' mimics a printing type calculator and even allows the output to go direct to your printer The functions include operations on three memories, logical operations such as XOR and percentage calculations. All modes limit input to 16 digits which is more than adequate except for, perhaps, the binary mode, decimal operation is limited to a maximum of 5 decimal places The 68000 s power is hardly best illustrated with this calculator when asking it to find the square root of 9999999999 which takes ten seconds! The MOD function doesn't appear to work at all it is supposed to return the remainder of two numbers divided for instance 23 MOD 12 should give an answer of 11 but instead it gives 8!
3 A notepad which keeps up to 32767 pages of 224 characters, each with a date and time stamp When looking for an old note you can go forward or backwards one or four notes at a time or simply reposition the slider bar to jump an arbitrary amount. It would seem that with up to 32767 pages to look through a search facility might have helped, but there is little reason why you would want to maintain more than a dozen of the most recent notes, however the deletion of old notes has to be done manually
4 A telephone dialler which also allows up to 32767 pages in the directory with an entry for a name, address and telephone number Fortunately there is a useful search facility on the directory, so locating someone should be a fast operation The format of the telelphone number is American with a code of three digits in brackets followed by seven digits, this is usable with U K. numbers except they are formatted a little strangely The phone dialler needs a Hayes-compatible modem to perform the dialling, the program is not however intended to be used for dialling bulletin boards.
5 A phone log which is used in conjuction with the dialler to keep a track of the type of call made, the number dialled and who it was to, as well as the duration of the call.
6. A game called Fifteen which is probably included to pass away the

time while waiting for a large program to compile!! The game is a familiar one to most people and consists of fifteen numbered squares which have to be re-arranged in the correct sequence by using the spare sixteenth square or hole.

7. A small analogue clock. There is not a lot to say about this except that it can be enlarged to cover the entire screen which gives it enormous hands! When the clock covers the entire screen it can be arranged such that it cannot be removed unless a password is typed in. This is included to make the display private but I have yet to be convinced of its usefulness.
8. A configuration program which allows the user to control which options will be selected or deselected when Cornerman boots in.
9. A utility to print out the selected contents of one of the data files kept by Cornerman, such as the telephone directory.
10. 'DOS Window' allows the user to run a program under TOS from within any other program. This is mainly – intended to be used with a command line interpreter (if you have one) so that file operations not supported by the application can be performed by the command line. Once you exit, Cornerman restores the screen of the application and allows it to continue.

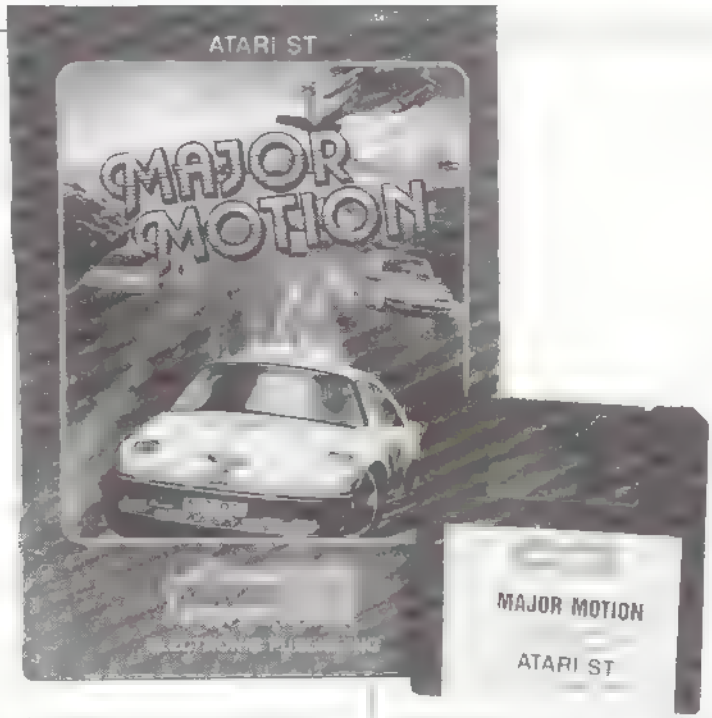
Although Cornerman is generally well written and usable, the price of £29.95 may be too high for those who will not be using all of its facilities. The only drawback the manual fails to mention is that it consumes in the region of 180K of memory which would leave about 40K for BASIC on a 520ST with ROMs! Therefore this program is only really practical on a larger machine such as the 1040ST or an expanded 520ST. It is also a pity that with so many clocks in the program an option to enter the date and time at power up was not provided instead of using the 'configure' accessory to set it.

Major Motion

By Microdeal
Reviewed by Sol Negrine

Well folks, arcade games are a comin' for the ST! This one is a re-vamp of Spy Hunter on the XL/XE, and features Major Motion whose mission is to rid the highways of the evil Draconian League. You, as Major Motion, control a deadly vehicle with a machine gun, driving along shooting every enemy in sight (sigh) sure could use this on the motorway on the way to the Monitor Magazine offices. As you progress, you collect further weapons such as repulsors (my favourite), smoke screens, oil slicks etc. Mindless mayhem is *not* advised however, as disposing of too many good guys brings swift retribution from on high in the form of rockets which home in on you unerringly.

So how does it play? The mouse controls your vehicle very smoothly, with left/right accelerate decelerate, and click/left for machine gun. Other weapons and facilities (e.g. oil, wagon, turbo boost) are assigned to keys and to the rightmost mouse button. A very good feature of the game is that you can assign any keys to your weapons, etc., indeed to anything except the fundamental left/right/acc. dec. motion. You need two hands to play this game (my sympathies if you haven't got them), one on the mouse and one at the keys of your choice – couldn't do this with a joystick: my mouse has as yet not complained (squeaked?) although with new action games coming out all the time (viz. new ones from Epyx also mouse-controlled) I guess it might one day (hard cheese).



What's not so good about it? Well, it's difficult to get a high score (20000+) without tactics and practice; it's frustrating and addictive, and at times the enemy vehicles/helicopter and the neutral vehicles appear to conspire against you unfairly (shades of the M1 here). The music is OK, although a bit soft, you do get a new tune after 10000 points. High scores are saved to disk, for which the disk must remain non-write protected, the program insists on recording your high score to the disk; don't worry, it's perfectly safe. Hackers and cheats can zap the high-score file KINGS.DAT, directly with any file sector editor utility (honest, guv, would I ever do such a thing?). The key disk protection method used, means you can boot only from Drive A, it never failed to go in on my 1MB AST drive though.

Graphics and colours are a definite improvement over the XL/XE equivalent. In summary, Major Motion is good, but not a mega step forward for the games player, it's fun and no more over priced than other current ST software. I enjoyed it very much, the arcade games player has treats in store on the ST. Watch this space!

NEW for the ST from microdeal

ELECTRONIC PUBLISHING

CORNERMAN £29.95

What Sidekick did for the IBM, *Cornerman* does better for your Atari ST! This utility gives you a host of useful desk-top tools in one simple, neat package. With every thing from a built in clock to a full function calculator, a cluttered desk is a thing of the past. And as a Desktop Accessory, *Cornerman* is a available nearly anywhere within GEM.

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- **ASCII TABLE** shows the ST's symbols with their decimal & hex values. Great for programmers!
- **PHONE BOOK** stores all your important names & numbers, dials through your* modem and even records elapsed calling time!
- **16 DIGIT CALCULATOR:** works in binary, octal, decimal, and hex, 3 memory registers; math and logic functions; base conversions, "tape" printer output.
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- **15-SQUARES GAME** simply for entertainment.
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* Hayes Compatible

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MEGAMAX and LATTICE C

Reviewed by Keith Mayhew
Review copies supplied by:
Mike's Computer Store,
Westcliff, Essex

This review studies two of the best C compilers currently available for the ST. MEGAMAX Inc. produce the MEGAMAX C compiler which, as many know, was used to write the free game MEGAROIDS. LATTICE, unlike MEGAMAX, is a very well established name amongst C compilers. The ST version of LATTICE C is produced by METACOMCO Plc.

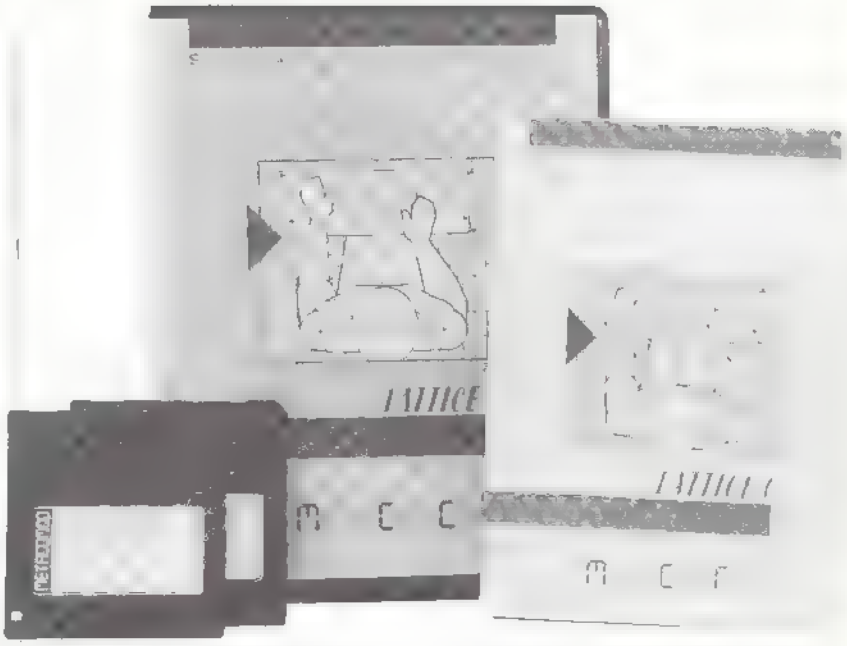
If you have been thinking about purchasing a C compiler for your ST then you should very seriously consider these two compilers. Their cost may seem prohibitive with LATTICE priced at £99.99 and MEGAMAX at £159.99 but either of them is a much better investment than some of the cheaper compilers, which generally do not implement the langauge fully, thus rendering them virtually useless for any serious work.

MEGAMAX and LATTICE have a few things in common. They are both excellent compilers and are a full implementation of the Kernighan and Ritchie 'standard' and both feature some common extensions, the most fundamental of these is the removal of the restriction that structures must not have common identifier names within them. The two compilers will now be examined separately.

LATTICE C

The manual supplied with LATTICE is of reasonable quality but unfortunately the poor binding could easily mean you might loose some of it sooner or later! The software is on two disks with the editor and compiler on one and the linker on the other. To speed program development, METACOMCO's MENU+ is supplied to invoke the separate programs from a GEM environment.

The compiler is of a two-pass nature and can produce object code which is either position-independent or the more common relocatable absolute format. The most interesting features of the compiler are as follows. Comments can be nested, character constants can be up to 4 characters long, identical constant strings inside a program can use the same storage i.e. only one copy is kept, characters can be signed or unsigned, the return type of void can be used for functions which don't return a value, variable identifiers can have either 8 or 31 significant characters.



Many of the above features are controlled by numerous options on the command line. Some of the most useful options allow you to set up a pre processor definition (#define) and to configure the size of the heap and the stack of the compiled module. The run-time support for a program allows you to set the heap and stack sizes as well as re direct standard input and output!

The compiler provides excellent error and warning checking. For example, few compilers produce a warning when a pointer is implicitly converted by assignment. A full set of libraries are available for use in your programs with a good implementation of the standard C library and full ST system libraries including GEM VDI and AES routines. The full source code for these library interfaces is supplied – very nice!

To produce an executable program the linker is used to combine all the modules used. It is a pity that the linker is on a separate disk to the compiler because it means disk swapping on half-megabyte drives (this is no problem for larger drives). The linker is GST's and is capable of many things including acting as a librarian for large library modules. It can also produce a sorted list of all identifiers as well as giving a full cross reference listing. The code linked by GST's linker must be position independent which means that to use the compilers absolute code format a separate DR compatible linker must be purchased. The only file which appeared to be missing was a start up module to link to programs which are to be used as desk accessories.

The last part of the LATTICE package is the editor. This is the standard editor which is supplied with all METACOMCO's products. There is not too much to say about this editor except that it is very standard with no GEM facilities used. However, its scrolling is very fast and the editor is very usable once you have remembered all the commands.

Megamax C

The main features of the MEGAMAX compiler are that it is one-pass, allows 10 significant characters in variable identifiers and, like LATTICE, allows up to 4 character constants. Its more outstanding features are the ability to include 68000 assembly language at any point in your code and the ability to treat structures as an entity i.e. they can be assigned to and passed by value to functions as well as the ability to return a structure from a function.

The MEGAMAX package is supplied in a very sturdy ring binder containing two disks and a manual. The manual is large and very clearly written with at least a page dedicated to each library function, including all the GEM calls. As well as an editor and linker the package is completed with a dedicated graphical shell, a librarian, a disassembler, a resource construction program and even a code improver! The editor, compiler, linker and shell are all

on the same disk which means that for most purposes disk swapping is not necessary and a small program can be compiled on the same disk, however, any compiler really needs two drives or a hard drive if you are going to write any reasonably sized program

The graphical shell is designed specifically for compiling C programs, unlike MENU+ and has a 'make' utility (like that of UNIX) which invokes the compiler and linker. Its advantage is that when the source is contained in several files it will only re-compile those files which were modified, it does this by looking at the time and date stamp on the file so it is important that you always set the time and date every time you use the compiler. One of the most impressive parts of the shell is the file selector. Instead of using the standard GEM file selector, MEGAMAX wrote their own which allows easy changing between drives and is extended further for selecting files for the linker and the librarian. The result is a very easy to follow system which is a pleasure to use.

The linker and the librarian manage the position independent object files generated by the compiler. The code improver utility can be used on any MEGAMAX object file and should reduce programs by up to 10% in size and increase their speed by up to 3%. The disassembler utility will accept any object file and produce a 68000 assembly language listing of its contents.

The editor operates under the GEM environment and allows simultaneous editing of several files with full cut and paste facilities. The editor is very usable with many attractive options such as automatic saving of the buffer every few minutes, automatic indentation for lining up code and the ability to make tabs visible as well as changing their size and have all the text change appropriately. After a compilation fails the editor is automatically invoked and the source file is read into a buffer and a list of the errors are read into another buffer and displayed in a separate window so that errors are easily corrected. This still isn't as good as the system used by MODULA-2 but it is better than using paper to write the errors down on! A nice extra to the editor is a complete chart of all the C operators showing their precedence and associativity which is readily at hand, this will save you wearing out your C handbook. The main down points of the editor are its slow horizontal scrolling giving a 'wave' down the screen and the fact that when you use the cursor keys the text scrolls but the cursor stays in the same place -- most annoying. This means that the mouse must be used to point at the place where you want the cursor every time you want to move.

Megamax C LANGUAGE DEVELOPMENT SYSTEM

ATARI ST

To turn the MEGAMAX package into a complete development system a resource construction program has been included. This is very similar to DR's resource construction set and enables resource files for GEM based applications to be created and edited easily. To go one better still they even included an excellent shape/icon editor for use within resources.

Conclusion

Both MEGAMAX and LATTICE are very good compilers. However LATTICE is just a minimal package whereas MEGAMAX is a complete development system offering outstanding value for money. Even though the LATTICE compiler is, arguably, slightly better, a resource construction program is really essential for anyone programming under GEM.

It should be made clear that although information is supplied with both compilers on the GEM interface, further documentation must be purchased. Unfortunately no comprehensive books have yet been published on GEM, short of the DR documentation set. It seems a pity that MEGAMAX went to so much trouble to produce their manual that they could not have gone just a little further and made it into a usable reference guide for GEM, BIOS and GEMDOS libraries. Oh well!

You may be asking now where the benchmarks are? Well I am afraid there aren't any. I personally feel that they can be misleading and certainly should not always be the primary concern when choosing between compilers. Benchmarks are very subjective to what the reviewer thinks will produce a fair comparison, if nothing else they should be very thorough and wide ranging to try and give as complete a comparison as possible. Of course it is important to point out when one compiler produces code which executes at a significantly different speed to another. I suspect that there is little difference between MEGAMAX and LATTICE but if benchmarks are important to you then I suggest you write your own program to test the compiler for your own needs before purchasing it. One very significant difference between the two compilers though is their compilation speed. A compile and link operation on a 30K source file took about three and a half minutes under MEGAMAX compared to about thirteen minutes under LATTICE. The final program size was about 25K for MEGAMAX compared to about 45K for lattice, however, I suspect that this is due to the inclusion of all the GEM and C libraries in the linking process. When LATTICE was used with the DR linker the program size dropped to a mere 22K which seems to indicate that LATTICE produced more compact code than MEGAMAX but is let down by the GST linker including all library routines!

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PROGRAM MEMORY DUMPER

After executing this utility a message will appear on your screen to load your boot disk or cassette. With the loaded program running you may save the file to disk at any point you wish, the saved file will be completely deprotected and the dumper will write a small boot loader file enabling the saved file to boot and run at the exact position it was initially jumped from. NOTE:this utility is not intended to be used for the pirating of copyrighted software but has a legitimate use for examining, debugging and backing up your own machine-code programs...

DISK I/O ANALYSER

Once installed you are requested to load your your boot disk. While the boot disk is loading the I/O analyser will send constantly updated information on where the DISK STATUS is requested from, the COMMAND STATUS HARDWARE STATUS, how many BOOT SECTOR'S there are the MEMORY LOCATION the program is starting at the SECTOR which is currently being requested, what is in the MEMORY BUFFER command sent to the DISK DRIVE, the DRIVE STATUS, and CALL ADDRESS of each sector being used by the program to the printer. The I/O analyser will continue to give information to the printer every time the program accesses the disk...

XL BOOT MENU

Update existing multi-boot menu's or create a XL-BOOT MENU file (10sectors). Boot up the menu, load your file, then at any time, with the touch of a button you're back to the menu instantly..

ALTER O.S. PARAMETERS

This option allows you to customise the operating system by turning on/off the noisy I/O, key click, inverse flash, CR=0 auto scroll, alter cassette baud rates, create new master default colour's and to create a new master character set from a choice of 10 inc. standard, you can then use the O.S. saver option or direct exit.

O.S. SAVER

Once you have customised the O.S parameter's to your requirement's you may save the O.S. to disk as a boot file. NOTE:you may also add one of the following-SNAPSHOT PRINTER DUMPER, PROGRAM MEMORY DUMPER or DISK I/O ANALYSER as part of the O.S. boot file.

ADD XL O.S. SAVER

This utility saves the O.S. from any pre-XE computer with or without your customised ROMS to disk as a boot load file.

THE HARDWARE

The O.S. XL CONTROLLER CARD hardware also has a range of switches which allow for many variations of the above software etc.

INSTALLATION

If your computer has chip holders then only 1 wire is needed to be soldered, if the chips are soldered directly to the printed circuit board then 2 chip holders must be inserted, this can be a bit tricky if you have little or no soldering knowledge so we will be glad to install the board free of charge except for the return p&p + ins. £5.50

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****

The AS&T 3.5in 1 Megabyte Disc Drive.

Evaluated by Mike Stringer.

AS&T (Advanced Systems & Techniques Ltd.) recently introduced a 1 Mega-byte disk drive for the ST series, retailing for the ridiculously low price of £99.00. What's the catch, I hear you say?

It is securely packaged in polystyrene and cardboard with the leads in a separate bag. Also enclosed is a clear pin-out of the two plugs, one power and the other data, for the disk drive. At one end of the data lead is the familiar fourteen pin to connect to the existing ST drive. At the other end is a thirty-four pin socket for connecting to the new drive. The power for the AS&T drive is taken, via a standard 5 pin DIN plug and socket, from the existing power port on the ST drive.

The connection is very simple if you have an ST 314/354 drive. The existing plug from the drive is plugged into the new DIN socket and the new DIN plug is fitted to the old drive. From this plug, a short lead - terminating in a white, four pin plug is inserted into the AS&T drive. The fourteen pin plug included with the package is inserted into the second drive port on the ST drive. The thirty four pin plug is fitted, the correct side upwards into the new drive completing the assembly. Simple, isn't it? It takes longer to read this than to assemble one!

The drive is manufactured by NEC, a time proven model. It comes in a double METAL shell, not an Atari PLASTIC shell! The dimensions are 15 cm's deep, 4 cms high and 10.5 cms wide, the colour is actually much closer to the 800 XL than it is to the ST, but it is not in the least objectionable because it is quite a close match to the colour of the keys!

Apart from the very compact size, at least compared to an ST 354 or 314, it is amazingly quiet. You are probably familiar with the fact that both motors will run when the other is booted. I had to do some extensive muffling of the ST drive in order to hear the AS&T! It is almost totally silent. There is no way, under normal operations, that any sound is heard.

The only problem that may arise to the owner of the new series of computers, is the absence of a power source. This can be overcome by tapping the power supply of the computer (AS&T have stated that it should be more than adequate). This can be done internally or externally, depending on the model. Either way, this to me is very bad practice. An alternative is to purchase a separate power supply producing 12V, 5V and ground. AS&T should have a suitable supply available by the time you read this review costing about £25. Contact them if there is any doubt.

Some difficulty may be experienced in configuring the AS&T drive to anything other than DRIVE B, which is the de-fault. To configure the drive to DRIVE A, a small rewiring modification of the ST drive is needed. This took about five minutes to complete, but any such changes will nullify your guarantee. In practice, it didn't matter really whether the new drive was designated A or B, two drive working was easy, whichever way it is configured!

Throughout the period of testing, I experienced no problems with the drive. All programs booted up with no problems, disk copying presented none and there was no noticeable increase in heat production in the power supply. My verdict is that the drive tested is a pleasure to use and represents outstanding quality and value-for money, living up to the Atari maxim of "Power without the price".

Pageflipper *Continued from page 14*

```
;Page Flipper for Gr.8
;====================
;
;By S. Hillen
;Written on SynAssembler.
;
        .LI OFF
        .OR $600    Anywhere
        .TF "D:PAGEFLIP.OBJ"
;
;Equates:-
;
SAVMSC  .EQ $58     OS Screen pointer.
SDLSTL  .EQ $230    Disp. list pointer.
PZ0     .EQ $CB     Page zero workspace.
;
;Call from BASIC with
;X=USR(1536,X) where X=0 or 1
;
;
START   PLA         Pull #arguments.
        PLA         Discard high byte.
        PLA         Get low byte.
        AND #1      Make into 0 or 1.
        TAX         Save in "X".
        LDA SDLSTL  Move the disp. list
        STA PZ0     vector into my
        LDA SDLSTL+1 workspace in
        STA PZ0+1   page zero.
        LDA SAVMSC+1 Get new screen addr.
        LDY #5      Index into disp. list.
        STA (PZ0),Y Save into LMS operand.
        LDY #101    Index to 2nd operand.
        CLC         But add
        ADC #15     15 pages on.
        STA (PZ0),Y Save into disp. list.
        LDA #32     No. of pages to add.
        CPX #0      If X is zero then
        BNE NOMIN   we subtract 32 pages
        LDA #-32    instead.
NOMIN   CLC         Clear carry.
        ADC SAVMSC+1 Change OS screen ptr.
        STA SAVMSC+1 and save back.
        STA PZ0+1   Also save here.
        LDY SAVMSC  Put lo. of addr in "Y".
        LDX #31     No. of pages to erase.
        LDA #0      Zero accumulator.
        STA PZ0     Zero lo. of pointer.
CLEAR   STA (PZ0),Y Erase whole Gr.8 screen.
        INY         Done a page?
        BNE CLEARL  Not yet...
        INC PZ0+1   Next page up.
        DEX         Any pages left?
        BNE CLEARL  Yes...
        RTS         No. Back to BASIC
```

Listing 2

Tempering the Atari

by Don Davis
From Piedmont Triad Atari Users' Group Newsletter, Greensboro, NC, U.S.A.

All but the newest Atari 8-bit computer users know how to produce sounds, even musical notes, with their computers. Just type in a SOUND statement in BASIC including parameters specifying the voice to be used, pitch, volume and distortion. Producing music is simplified, because Atari provides a chart showing the pitch values most closely corresponding to the frequencies of notes on the standard musical scale. This chart is reproduced in numerous publications, ranging from the Atari Basic Reference Manual to Compute! magazine's Mapping the Atari. There's just one problem with the chart. If you've tried to use it to write multiple-voice music for your computer, you've no doubt discovered that the voices don't harmonise.

Of course, there is the option of combining pairs of voices to produce two high-resolution voices. That's hardly a satisfactory alternative, however, if you want to use three or four voices.

For weeks, I was convinced there was some obscure programming trick that could be executed in machine language to produce four high-resolution voices simultaneously. I kept looking for someone who could give me a hint about the approach. I spent hours in conference mode on Compuserve asking people about it. I left messages all over the system, all to no avail.

One fortunate night, as I chatted rather aimlessly with some folks on Compuserve, who should pop in but Bill Wilkinson. Yes, I'm talking about THE Bill Wilkinson of O.S.S., one of the authors of Atari BASIC, among other things, as well as a monthly Atari column in Compute! Bill straightened me out in moments. Four simultaneous high-resolution voices are physically impossible, but reasonably good four-voice harmony is not.

The key is forgetting that oft-published note chart Atari so thoughtfully provided. The chart, he explained, is the best approximation the computers can provide of each note on the standard scale. All well and good if you're planning to accompany your computer on the piano. For the various voices of the computer to harmonise with one another, however, the frequencies of the tones played must conform with reasonable precision to a known mathematical relationship.

Obviously, I knew that music is based on mathematics, but I had never taken the time to investigate the subject. So Bill filled me in. The frequency of any given note on the scale is exactly double the frequency of the note one octave below it. Since there are twelve notes in an octave (counting sharps and flats), the relationship between adjacent notes is the twelfth root of two. That is, if X is the frequency of a particular note, and Y is the frequency of the next higher note, then Y = X*2^(1/12).

NOTE	OCTAVE	1	2	3	4	5	6
C			14	29	59	120*	241
B			15	31	63	127	255
A# or Bb			16	33	67	135	
A			17	35	71	143	
G# or Ab			18	37	75	151	
G			19	39	80	160	
F# or Gb			20	42	84	170	
F			22	44	90	180	
E			23	47	95	191	
D# or Eb			24	50	101	202	
D			26	53	107	214	
C# or Db		13	28	56	113	227	

* Approximates Middle C

Table 1.

So what is the value of this brief lesson in music theory? We can use it to create our own note chart, a chart based on frequencies natural to the Atari and the intervals between the notes. Of course, this music may not be in tune with your piano, but who cares? The important fact is that the computer's voices will be reasonably in tune with each other.

First, we must know what frequencies the pitch values 0-255 represent. The formula for calculating the frequencies is available in the Technical Reference Notes. Where C is the input clock frequency and N is the pitch value, the output frequency (the tone you hear) is found by C/(2*N). The input clock frequency defaults to 64kHz (actually, 63.921kHz) but can be adjusted to approximately 15kHz or 1.79MHz.

I won't put you through all the computations necessary to find a suitable scale for the computer. I wrote a little BASIC program that computed the frequencies represented by all pitch values and loaded them into the array. The program then began with the frequency represented by a pitch value of 255, the lowest note the computer can produce, and used the twelfth root of two rule to compute, one by one, the frequency of each note on the scale. As each frequency was calculated, the program compared the desired frequency to the list of available frequencies stored in the array and stored in another array the closest match.

Once the computations were complete, the process was repeated 10 more times, using each of the eleven highest pitch values (245-255) as the starting point. When all the results had been stored, the program printed out 11 corresponding tables, showing the desired frequencies, the nearest practical match for each, the difference in Hertz and the per cent by which the available frequency deviated from the desired frequency. I then examined each of the tables to find the one which combined the largest note range with the lowest overall deviation from desired frequencies.

I have provided a table similar to the one distributed by Atari showing a scale of notes and the corresponding pitch value for each note. If you compare this table to the Atari scale you will find considerable similarity. The difference is mainly in the pitch values in the middle of the note range, where my pitch values differ from the Atari-supplied values by one or two. This may seem a small adjustment, but believe me, the result is not small.

I'm not saying you can use this table to convert any and every piece of music you like for your computer. Some pieces require closer adherence to what is known as the 'tempered scale' than others, and much music may require a level of adherence your computer can't provide.

What I am saying is that I believe your music will sound much better using the table reproduced here than using the Atari table. Try it both ways and see what you think. Feel free, also, to make your own adjustments.

As for me, I have found a new interest in programming music on my computer now that I know more about the capabilities (and limitations) of four-voice low-resolution sound.

CRACKING THE CODE

by Keith Mayhew Part Nine

In the previous issue we looked at the way in which the memory map is organised. As far as the hardware is concerned, almost every action of the ATARI is controlled by one of the four main chips of the machine. We start this time with a description of the tasks they perform and the facilities available.

Names were put to the four chips last time GTIA ANTIC POKEY and PIA The first three are totally custom. that is they were designed specifically for the ATARI machines The PIA chip, however, is a standard chip found in many other computers

The Chips

The addresses of the registers of these four chips are listed in Table 1 together with the names by which they are normally referred. Hyphenated names represent a set of names all differing by a single digit e g TRIG0-3 represents TRIG0 TRIG1, etc and correspond to the range of addresses shown Do not forget that if a register is write only then you will not be able to read the same data back again, similarly, any data written to a read only register will not affect its contents For instance it is easy to fall into the trap of using an INC instruction to try to add one to the contents of a write-only register 'Shadow registers are maintained by the operating system for some of the registers. these are shown in the table to the right of a register if applicable. Most of these are used to hold the data to be written to a write only register this update occurs 50 times every second Thus by using these shadows it is possible to read back the data currently used without having to keep your own private copy

We will start with GTIA and ANTIC which are primarily concerned with producing the display image These two chips are functionally independent of each other but neither are of any practical use without the others help It is therefore best if you consider these two chips as one large chip which controls the display ANTIC is said to have derived its name from 'AlphaNumeric Television Interface Controller' This is rather an understatement of its capabilities as it is in fact a second processor to the 6502 which executes its own sepcial, limited, instruction set dedicated to producing the main display information GTIA, said to stand for 'George s Television Interface Adaptor takes the bare output of ANTIC and brings it to life by adding colour information and player missile data

Listing 1 shows a program to display a single player on the screen in the form of a large cursor and allows it to be moved around the screen within the confines of standard screen area Listing 2 shows a BASIC program which loads the code in To run it type

```
X=USR(1536)
```

Then it will return after displaying the player at the top left of the screen The graphics mode is irrelevant as players can be displayed on any type of screen Once the program returns. BASIC can continue processing because the player is moved under joystick control by a routine which executes 50 times a second during each vertical blank. This is the period of time when the electron beam stops drawing and returns to the top of the screen after each frame has been displayed

Before we study how the program works we will look at the facilities offered to control the display of players and missiles.

Sprites

Player missiles, or sprites as they are commonly known, are objects which can be displayed and moved independantly of the main image with great ease and speed. The player/missile data displayed at any time is dependent on the contents of the player missile graphics registers The registers are GRAFP0 to GRAFP3 for each of the four players and GRAFM to control the four missiles On every scan line of the screen these graphics registers are read and their data is displayed at the current horizontal positions for each as determined by the eight registers HPOSP0 to HPOSP3 and HPOSM0 to HPOSM3 For the four players, all eight bits in the appropriate graphics register are displayed, a bit set to zero will cause no change to the display i e they are transparent The missile graphics register controls the display for each of the four missiles Bits 0 and 1 correspond to missile 0 and are positioned according to HPOSM0, the rest of the bits are assigned to the other three missiles in sequence such that bits 6 and 7 control missile 3

If you position a player or missile on the screen by writing to its horizontal position register and then write some data to its graphics register then the pattern will be displayed down the screen as a vertical bar For instance try the following from BASIC

```
POKE 53261 255
POKE 53248,128
```

This sets the data for player 0 to 255 , e all ones, and positions it roughly

NOTE: (R)= Read only, (W)=Write only, (R/W)=Read & Write

NAME		ADDRESS (HEX)	NAME	ADDRESS (HEX)
GTIA REGISTERS			**O.S. SHADOW**	
PAL	(R)	D014		
CONSOL	(R/W)	D01F		
GRACTL	(W)	D01D		
TRIG0-3	(R)	D010-D013	STRIG0-3	0284-0287
VDELAY	(W)	D01C		
PRIOR	(W)	D01B	GPRIOR	026F
HITCLR	(W)	D01E		
GRAFP0-3	(W)	D00D-D010		
GRAFM	(W)	D011		
SIZEP0-3	(W)	D008-D00B		
SIZEM	(W)	D00C		
HPOSP0-3	(W)	D000-D003		
HPOSM0-3	(W)	D004-D007		
M0-3PF	(R)	D000-D003		
P0-3PF	(R)	D004-D007		
M0-3PL	(R)	D008-D00B		
P0-3PL	(R)	D00C-D00F		
COLPF0-3	(W)	D016-D019	COLOR0-3	02C4-02C7
COLBK	(W)	D01A	COLOR4	02C8
COLPM0-3	(W)	D012-D015	PCOLR0-3	02C0-02C3
ANTIC REGISTERS			**O.S. SHADOW**	
NMIEN	(W)	D40E		
NMIST	(R)	D40F		
NMIRES	(W)	D40F		
WSYNC	(W)	D40A		
VCOUNT	(R)	D40B		
PENV	(R)	D40D	LPENV	0235
PENH	(R)	D40C	LPENH	0234
CHBASE	(W)	D409	CHBAS	02F4
PMBASE	(W)	D407		
CHACTL	(W)	D401	CHART	02F3
DMACTL	(W)	D400	SDMCTL	022F
DLISTL	(W)	D402	SDLSTL	0230
DLISTH	(W)	D403	SDLSTH	0231
VSCROL	(W)	D405		
HSCROL	(W)	D404		
POKEY REGISTERS			**O.S. SHADOW**	
SKCTL	(W)	D20F	SSKCTL	0232
SKSTAT	(R)	D20F		
SKRES	(W)	D20A		
SERIN	(R)	D20D		
SEROUT	(W)	D20D		
IRQEN	(W)	D20E	POKMSK	0010
IRQST	(R)	D20E		
KBCODE	(R)	D209	CH	02FC
ALLPOT	(R)	D208		
POT0-7	(R)	D200-D207	PADDL0-7	0270-0277
POTGO	(W)	D20B		
AUDCTL	(W)	D208		
AUDC1	(W)	D201		
AUDC2	(W)	D203		
AUDC3	(W)	D205		
AUDC4	(W)	D207		
AUDF1	(W)	D200		
AUDF2	(W)	D202		
AUDF3	(W)	D204		
AUDF4	(W)	D206		
STIMER	(W)	D209		
RANDOM	(R)	D20A		
PIA REGISTERS			**O.S. SHADOW**	
PORTA	(R/W)	D300	STICK0-1	0278-0279
PORTB	(R/W)	D301	STICK2-3	027A-027B
PACTL	(R/W)	D302		
PBCTL	(R/W)	D303		

Table 1

in the middle of the screen. To display a proper image on the screen requires changing the data in the graphics register in real time i.e. on every scan line

Although this can be achieved by machine code, with appropriate timing, this process can be automated by the ANTIC chip by a function known as Direct Memory Access or DMA. This allows data to be fetched from memory independently of the 6502 and at a faster rate. If this method is used then the data for players and missiles is stored in a table and ANTIC is informed where to find it via a register called PMBASE. If player/missile DMA is enabled then ANTIC will fetch the data for the players and missiles and store it in GTIA's graphics registers on each scan line, thus building up the images in the table onto the screen in real time

We will now look at the program in Listing 1 to see how a player can be moved around the screen using ANTIC's DMA to transfer the data from a table. The first equates define the locations used in the hardware for player missile generation. The next two equates are vectors within the operating system to gain access to the vertical blank processor. The O.S. shadows are then defined followed by the program's equates. PLRTAB is the address where the player missile table will be stored and P0STRT is the address in that table of where the data for player 0 is stored. XMIN and XMAX define the confines of the horizontal position of player 0 to keep it on the screen. YMIN and YMAX are the indexes into the player's data area to keep the image on the screen. Lastly, COLOUR is the value which will be stored in the player's colour register to set it to white

CURSX and CURSY in page zero are used to keep track of the player's current position. The program starts off by initialising some registers ready for the display of players. The routine INITPM first sets the position of each of the players to zero (off screen) and then sets the colour and size of player 0. PMBASE is then loaded with the high byte of the address of our player table (PLRTAB). To enable ANTIC to perform DMA we alter some bits in the shadow DMA control register (SDMCTL). Clearing bit 4 and setting bit 3 gives 2 line resolution and enables DMA respectively. Note that we could have simply stored an actual number in SDMCTL but instead we are not altering the effect of any of the other bits currently used by using AND and OR operations to set and clear the appropriate bits we are interested in. Lastly, storing 2 in the graphics control register allows the DMA data to be transferred into GTIA's graphics registers

The routine CLEAR is then executed to zero any data stored in player 0's 128 byte data area in the table. The value in CURSX is set to its

```
0100 ;Hardware register equates...
0110 PMBASE  =      $D407   ;Player/missile base.
0120 GRACTL  =      $D01D   ;Graphics control.
0130 HPOSP0  =      $D000   ;Horizontal pos. of player 0.
0140 SIZEP0  =      $D008   ;Size of player 0.
0150 ;Operating system vectors...
0160 SETVBV  =      $E45C   ;Set vertical blank vector.
0170 XITVBV  =      $E462   ;Exit vertical blank vector.
0180 ;Operating system shadows...
0190 STICK0  =      $0278   ;Joystick 0 value.
0200 SDMCTL  =      $022F   ;DMA control.
0210 PCOLR0  =      $02C0   ;Colour of player 0.
0220 ;Program equates...
0230 PLRTAB  =      $4000   ;Start of player/missile table.
0240 P0STRT  =      PLRTAB+$200 ;Start of player 0 data.
0250 XMIN    =      $3D     ;Minimum X position.
0260 YMIN    =      $0F     ;Minimum Y position.
0270 XMAX    =      $CB     ;Maximum X position.
0280 YMAX    =      $67     ;Maximum Y position.
0290 COLOUR  =      $0F     ;Colour of player.
0300 ;Page zero variables...
0310         *=     $CB     ;Set to page zero area.
0320 CURSX   *=     *+1     ;Cursor X position.
0330 CURSY   *=     *+1     ;Cursor Y position.
0340         *=     $0600   ;Start program at page 6.
0350         PLA            ;Clean stack.
0360         JSR    INITPM  ;Initialise player/missiles.
0370         JSR    CLEAR   ;Clear player 0 data area.
0380         LDA    #XMIN   ;Set X position
0390         STA    CURSX   ; to minimum.
0400         STA    HPOSP0  ;Save in register too.
0410         LDA    #YMIN   ;Set Y position
0420         STA    CURSY   ; to minimum.
0430         JSR    DRAW    ;Draw cursor there.
0440         LDY    #VBI&$FF ;Get address of VBI routine
0450         LDX    #VBI/256 ; in X & Y registers.
0460         LDA    #7      ;Deferred VBI.
0470         JSR    SETVBV  ;Change vector.
0480         RTS            ;All done - back to BASIC.
0490 ;
0500 ; Vertical blank interrupt.
0510 VBI     LDA    STICK0  ;Get stick value.
0520         CMP    #$0F
0530         BEQ    VBEXIT  ;Exit if no movement.
0540         JSR    ERASE   ;Erase current cursor image.
0550         LDA    STICK0  ;Get stick value.
0560         AND    #1      ;Test 'up' bit.
0570         BNE    DOWN    ;Skip if not down.
0580         LDA    CURSY   ;Test Y value
0590         CMP    #YMIN   ; against minimum.
0600         BEQ    LEFT    ;Skip if there.
0610         DEC    CURSY   ;Decrement Y value.
0620         JMP    LEFT    ;Try left direction.
0630 DOWN    LDA    STICK0  ;Get stick value.
0640         AND    #2      ;Test 'down' bit.
0650         BNE    LEFT    ;Skip if not down.
0660         LDA    CURSY   ;Test Y value
0670         CMP    #YMAX   ; against maximum.
0680         BEQ    LEFT    ;Skip if there.
0690         INC    CURSY   ;Increment Y value.
0700 LEFT    LDA    STICK0  ;Get stick value.
0710         AND    #4      ;Test 'left' bit.
0720         BNE    RIGHT   ;Skip if not down.
0730         LDA    CURSX   ;Test X value
0740         CMP    #XMIN   ; against minimum.
0750         BEQ    MOVE    ;Skip if there.
0760         DEC    CURSX   ;Decrement X value.
0770         JMP    MOVE    ;Skip to move.
0780 RIGHT   LDA    STICK0  ;Get stick value.
0790         AND    #8      ;Test 'right' bit.
0800         BNE    MOVE    ;Skip if not down.
0810         LDA    CURSX   ;Test X value
0820         CMP    #XMAX   ; against maximum.
0830         BEQ    MOVE    ;Skip if there.
0840         INC    CURSX   ;Increment X value.
0850 MOVE    LDA    CURSX   ;Update player position.
0860         STA    HPOSP0
0870         JSR    DRAW    ;Re-draw player shape.
0880 VBEXIT  JMP    XITVBV  ;Exit to operating system.
0890 ;
0900 ;Initialise player/missiles.
0910 INITPM  LDA    #0      ;Get zero.
0920         LDX    #3      ;Set index.
0930 POSLP   STA    HPOSP0,X ;Zero position of player.
0940         DEX            ;Next player.
0950         BPL    POSLP   ;All done?
0960         LDA    #COLOUR ;Get colour value.
0970         STA    PCOLR0  ;Set player's colour.
0980         LDA    #0      ;Set size to normal.
0990         STA    SIZEP0
1000         LDA    #PLRTAB/256 ;High byte of table address.
1010         STA    PMBASE  ;Save in hardware register.
1020         LDA    SDMCTL  ;Get DMA control value.
1030         AND    #$EF    ;Set 2-line resolution.
1040         ORA    #$08    ;Enable player DMA.
1050         STA    SDMCTL  ;Save back.
1060         LDA    #$02    ;Allow player image
1070         STA    GRACTL  ; to be displayed.
1080         RTS            ;Return.
1090 ;
1100 ;Erase all data for player 0.
1110 CLEAR   LDY    #$7F    ;Index to end of area.
1120         LDA    #0      ;Data is zero.
1130 CLRLP   STA    P0STRT,Y ;Zero a byte.
1140         DEY            ;Next one.
1150         BNE    CLRLP   ;All done?
1160         RTS            ;Return.
1170 ;
1180 ;Erase cursor at current Y position.
1190 ERASE   LDA    CURSY   ;Get cursor Y vaue.
1200         CLC            ;Add on number of bytes
1210         ADC    #CRSLEN ; of cursor data.
1220         TAY            ;Save as index.
1230         LDA    #0
1240 ERASLP  STA    P0STRT,Y ;Zero a byte.
1250         DEY            ;Next one.
1260         CPY    CURSY   ;Test against limit.
1270         BPL    ERASLP  ;All done?
1280         RTS            ;Return.
1290 ;
1300 ;Draw cursor at current Y position.
1310 DRAW    LDA    CURSY   ;Get cursor Y position.
1320         CLC            ;Add on number of bytes
1330         ADC    #CRSLEN ; of cursor data.
```

Listing 1

```
1340          TAY             ;Save as index.
1350          LDX   #CRSLEN-1 ;Index to end of cursor data.
1360 DRAWLP   LDA   CURSOR,X  ;Get data byte.
1370          STA   PBSTRT,Y  ;Save it in player area.
1380          DEY             ;Next byte in player.
1390          DEX             ;Next byte in table.
1400          BPL   DRAWLP    ;All done?
1410          RTS             ;Return.
1420 ;
```

```
1430 ;Data for cursor.
1440 CURSOR   .BYTE   $18     ;Image data.
1450          .BYTE   $18
1460          .BYTE   $18
1470          .BYTE   $E7
1480          .BYTE   $E7
1490          .BYTE   $18
1500          .BYTE   $18
1510          .BYTE   $18
1520 CRSLEN   =       *-CURSOR ;Number of bytes defined.
```

minimum value and the horizontal position register (HPOSP0) is updated with the same value CURSY is then initialised to its minimum value and the image is drawn at the position in the player table by the routine DRAW This copies the data at the end of the program referred to as CURSOR into the player table at the index specified by CURSY The number of bytes to be copied is eight, but this has been left to the assembler to calculate by the expression CRSLEN * CURSOR This subtracts the address of the first byte of the byte of the image away from the address of the last plus one, thus giving the number of bytes defined. The advantage of this is that more BYTE's could be added and the program would deal with the extra data without any other changes. The last thing the program does before returning is to tell the operating system where to find our vertical blank routine called VBI. This is done via a call to SETVBV in the operating system with X and Y pointing to the routine and A holding the number 7

The VBI routine tests the joystick for any movement If the joystick is not moved then the program returns to the operating system by a jump to XITVBV Otherwise the joystick has been moved and the image is erased from the player table in anticipation of a vertical movement up or down the data table The variables CURSX and CURSY are then updated depending on the joystick state The horizontal position of the player is then updated and the image is redrawn at the current CURSY value.

Note that the vertical repositioning of the player requires moving its data up or down in the player missile table. This has been achieved by erasing and re drawing the image at a new position Alternatively two routines could have been written to move the data in the table up or down as required by an arbitrary number of bytes The best movement routine will depend on the program using it For instance in this case the cursor is only ever moved by one byte at a time so a simple dedicated pair of routines could have been written to move the shape by only one byte up or down which would have been faster but more limited

Next time we will continue our look at the graphics facilities in more detail and start looking at display lists.

```
QZ 10 DIM HEX$(16)
CV 20 LINE=10000:TRAP 100:J=0:START=1536
VA 30 READ HEX$,CHKSUM:SUM=0
AA 40 FOR I=1 TO 15 STEP 2
ZB 50 D1=ASC(HEX$(I,I))-48:D2=ASC(HEX$(I+
   1,I+1))-48
KT 60 NUM=((D1-7*(D1>16))*16+(D2-7*(D2>16
   )))
LW 70 SUM=SUM+NUM:POKE START+J,NUM:J=J+1:
   NEXT I
LY 80 IF SUM=CHKSUM THEN LINE=LINE+10:GOT
   O 30
JN 90 ? "Checksum error on this line:"
VO 95 LIST LINE:END
YS 100 PRINT "Data in memory."
NY 10000 DATA 68207686289F86A9,626
AP 10010 DATA 3085CB8D00D0A9BF,917
WR 10020 DATA 85CC20BB86A01FA2,915
KR 10030 DATA 06A9072085CE468A0,803
EU 10040 DATA 7002C90FF84D20AA,857
NU 10050 DATA B6AD78B229B1D00B,562
LY 10060 DATA A5CCC90FF014C6CC,1247
RC 10070 DATA 4C4A86AD78B22902,494
QD 10080 DATA D0B0A5CCC967F002,1131
BW 10090 DATA E6CCAD78B22904D0,982
EZ 10100 DATA 0BA5CBC930F014C6,1006
QT 10110 DATA CB4C6BB6AD780229,728
SQ 10120 DATA B0D008A5CBC9CBF0,1233
LF 10130 DATA 02E6CBA5CBBD00D0,1152
KD 10140 DATA 20BBB64C62E4A900,796
LS 10150 DATA A2039D00D0CA10FA,998
WN 10160 DATA A90F8DC002A900BD,829
JX 10170 DATA 00D0A9408D0704AD,982
WJ 10180 DATA 2F0229EF09808D2F,534
CQ 10190 DATA 02A9B28D1DD060A0,807
XW 10200 DATA 7FA900998042B8D0,859
RM 10210 DATA FA60A5CC1969B0A8,1020
KR 10220 DATA A9B099B04288C4CC,924
KS 10230 DATA 18FB60A5CC186980,866
TP 10240 DATA A8A207BDCE849900,891
HS 10250 DATA 4208CA10F6601818,810
LQ 10260 DATA 18E7E7181818,558
```

Listing 2.

RUNS IN 32K CASSETTE OR DISK

DEMON

by Adrian Cox.

As a servant in the castle of Baron Azka you know that he experiments with magic. You also know that he is very clumsy. The two never go together! The Baron has had an unfortunate accident and released a demon in the castle. You have escaped by hiding in a tower room, but you cannot hide there forever. It is morning as you leave your room, discover what has occured and realise that the Barons demon is after you.

When typing in the program, you can use the two check letters before each line if using a checksum program such as KEYO or TYPO. If not, just ignore the codes.

NOTE. In this program, anything which is underlined should be entered in 'INVERSE'

```
EI 1 REM ********************************
YP 2 REM *    DEMON BY ADRIAN COX       *
EK 3 REM ********************************
OW 4 REM * INPUT ROUTINE ADAPTED FROM  *
YW 5 REM * EXPLORING ADVENTURES ON THE *
JW 6 REM * ATARI 48K BY PETER BERRARD  *
EQ 7 REM ********************************
MV 8 REM *   MONITOR MAGAZINE 1986      *
EQ 9 REM ********************************
GW 10 POKE 82,0:SETCOLOR 2,1,0:SETCOLOR 1
   ,0,10:POKE 752,1:? :POKE 16,64:POKE 53
   774,64
MJ 20 OPEN #1,4,0,"K:":GOSUB 30000
XT 30 VERBS=54:NOUNS=47
AR 40 DIM CM$(27),A$(1),VB$(4),NO$(4),N1$
   (4),OB(NOUNS),P(34,6),X$(40),BI$(15),C
   S$(17),OK$(4),ST$(13)
NO 50 SI$="Don't be silly.":CS$="You can'
   t see it.":OK$="O.k.":ST$="Strange ide
   a."
CY 60 ? :? "SETTING UP..."
FZ 70 RESTORE 1000:FOR A=1 TO 34:FOR B=1
   TO 6:READ X:P(A,B)=X:NEXT B:NEXT A
VD 80 RESTORE 980:FOR A=1 TO NOUNS:READ X
   :OB(A)=X:NEXT A
SP 90 CP=1:IN=0:DF=-1:DO=0:PL=0:CB=0:? "P
   RESS ANY KEY":GET #1,KEY:?
UF 100 GOSUB 1350
QW 110 IF DF>0 THEN DF=DF-1
TX 120 IF DF=0 THEN OB(20)=CP
KH 130 TRAP 110
LH 140 IF DF=0 AND (CP<>33 OR CB=0) THEN
   ? "The demon catches you.":GOTO 700
WK 150 IF DF>0 THEN ? "You can hear the d
   emon moving."
JM 160 IF DF=0 AND CP=33 AND CB=1 THEN ?
   "The demon is unable to enter the circ
   le.";
TH 170 GOSUB 240
NB 180 IF VB>19 THEN 210
IU 190 ON VB GOSUB 1240,1350,1870,1800,18
   90,2030,2070,2100,2190,2230,2230,2270,
   2330,2420,2510,2550,2730,2740,3330
LS 200 GOTO 110
GG 210 ON VB-19 GOSUB 3400,2840,2880,2900
   ,2960,3010,3080,3120,3190,3230,3280,35
   80
LW 220 GOTO 110
NX 230 END
CV 240 ? :CM$="":A$="":I=1
ZT 250 ? "What now ? ";
HX 260 ? "+";CHR$(30);
NU 270 GET #1,Z
QR 280 IF I=1 AND Z=32 THEN 270
IE 290 IF Z>127 AND Z<>155 AND Z<>156 THE
   N Z=Z-128:POKE 694,0
DC 300 IF Z<32 OR Z=127 THEN 270
MV 310 IF Z>95 AND Z<126 THEN Z=Z-32:POKE
    702,64
BU 320 IF Z=156 THEN CM$="":I=1:? CHR$(15
   6);:GOTO 250
XL 330 A$=CHR$(Z)
IT 340 ZL=LEN(CM$):IF ZL>26 THEN 360
ME 350 IF Z<>155 AND Z<>126 THEN CM$(I,I)
   =A$:? A$;:I=I+1:GOTO 260
TB 360 IF Z=155 AND ZL>0 THEN ? " ";I=1:?
   :GOTO 400
EL 370 IF Z=126 AND ZL>1 THEN ? " ";A$;A$
   ;:CM$=CM$(1,ZL-1):I=I-1:GOTO 260
QR 380 IF Z=126 AND ZL=1 THEN CM$="":I=1:
   ? CHR$(156);:GOTO 250
QY 390 GOTO 260
CS 400 N1$="":NO$="":VB$="":VB=0:NO=0:CM=
   LEN(CM$):H=0
KI 410 H=H+1:IF H>CM THEN H=CM:GOTO 430
IZ 420 IF CM$(H,H)<>" " THEN 410
GM 430 K=H:I=H:IF I>4 THEN I=4
BT 440 VB$=CM$(1,I)
JS 450 IF LEN(VB$)<4 THEN VB$(LEN(VB$)+1)
   =" ":GOTO 450
NZ 460 RESTORE 760:REM ****
LR 470 FOR A=1 TO VERBS
PA 480 READ N1$,V:IF N1$=VB$ THEN VB=V:GO
   TO 500
DK 490 NEXT A
AD 500 H=H+1:IF H<=CM THEN 530
XC 510 IF VB=0 THEN NO$=VB$:VB=1:I=1:GOTO
    610
ZF 520 RETURN
YM 530 IF CM$(H,H)=" " THEN 510
UD 540 IF VB=0 THEN ? "I don't know how t
   o ";CM$(1,K):GOTO 240
MC 550 I=H
SU 560 H=H+1:IF H>CM THEN H=CM:GOTO 580
PV 570 IF CM$(H,H)<>" " THEN 560
RQ 580 J=H:IF J-I>4 THEN J=I+4
HF 590 NO$=CM$(I,J)
SD 600 IF LEN(NO$)<4 THEN NO$(LEN(NO$)+1)
   =" ":GOTO 600
VC 610 RESTORE 900
XV 620 FOR A=1 TO NOUNS
ER 630 READ N1$:IF N1$=NO$ THEN NO=A:GOTO
    650
DC 640 NEXT A
XV 650 IF H>CM THEN H=CM
YQ 660 IF NO=0 AND NO$<>"" THEN ? "I don'
   t understand ";CM$(1,H):GOTO 240
WK 670 IF NO=13 AND OB(1)=0 THEN NO=38
IM 680 IF NO=15 AND OB(3)=0 THEN NO=28
ZU 690 RETURN
YO 700 ? "You are dead."
ZR 710 ? "Play again (Y/N)?"
NF 720 GET #1,A:A$=CHR$(A)
PQ 730 IF A$="N" OR A$="n" THEN END
NT 740 IF A$="Y" OR A$="y" THEN RUN
PA 750 GOTO 720
JB 760 DATA GO  ,1,WALK,1,ENTE,1,LOOK,2,L
      ,2
RM 770 DATA SCOR,3,HELP,4,GET ,5,TAKE,5
AM 780 DATA INVE,6,I   ,6,PUT ,7,DROP,7
TL 790 DATA OPEN,8,CLOS,9,SHUT,9,DRIN,10
NJ 800 DATA EAT ,11,CUT ,12,SLAS,12,CHOP,
   12
CW 810 DATA CLIM,1,LIGH,14,IGNI,14
SS 820 DATA ATTA,15,KILL,15,HIT ,15
SF 830 DATA EXAM,16,JUMP,17,DIG ,26
ZH 840 DATA PUSH,18,PULL,18,MOVE,18
PL 850 DATA SAVE,19,LOAD,20,REST,20
KZ 860 DATA SAY ,21,SHOU,21,YELL,21
QH 870 DATA RUN ,22,THRO,23,PLUC,24
VA 880 DATA BREA,25,SMAS,25,READ,13,SHOO,
   27
```

```
JF 890 DATA FIL,20,DRAW,29,COMP,29,JOIN,
   29,POUR,30,BURN,14,QUIT,31,END ,31
KE 900 DATA N   ,S   ,E   ,W   ,U   ,D
   ,NORT
BX 910 DATA SOUT,EAST,WEST,UP  ,DOWN
TL 920 DATA BIRD,FEAT,BUCK,SPAD,NOTE,WOOD
QL 930 DATA ASHE,BOW ,ARRO,POLE,CHAL,KNIF
ML 940 DATA BOOK,SCRO,TORC,BUCK,WATE,BIRD
NX 950 DATA BONE,DEMO,CHES,CURT,BED ,CRAT
NC 960 DATA CIRC,CORP,FIRE,LEVE,SUBS,PORT
IY 970 DATA WELL,TABL,SHEL,MITT,SYMB
FG 980 DATA 0,0,20,27,0,0,0,14,14,23,0,0,
   18,0
NG 990 DATA 0,0,24,2,28,28,9,29,7,11,32,3
   3,13,23,23,22,21,20,18,0,18
QY 1000 DATA 0,0,0,12,0,0,0,0,0,0,0,3
MS 1010 DATA 0,0,4,0,2,5,0,0,0,3,0,0
VM 1020 DATA 0,0,6,7,3,0,0,0,0,5,0,0
US 1030 DATA 0,9,5,0,0,0,5,10,0,0,0,14
NM 1040 DATA 7,0,10,0,0,0,0,0,11,9,12,0
ER 1050 DATA 0,0,0,10,0,0
UO 1060 DATA 0,0,1,0,13,10,0,0,0,0,0,12
AQ 1070 DATA 0,15,0,0,0,0,14,16,0,0,0,0
ZG 1080 DATA 15,17,19,21,0,0,16,18,0,0,0,
   0
AG 1090 DATA 17,0,0,0,0,0,0,0,20,16,0,0
DQ 1100 DATA 0,0,0,19,0,0,0,0,16,22,0,24
MF 1110 DATA 0,0,21,0,23,0,0,0,0,0,0,22
TP 1120 DATA 0,0,0,0,21,0,0,0,0,0,7,26
FV 1130 DATA 0,0,0,27,25,0,0,0,26,0,0,0
SY 1140 DATA 0,29,0,0,0,0,0,29,31,29,0,29
SA 1150 DATA 30,32,31,29,31,30,29,31,31,3
   0,30,31
PK 1160 DATA 30,0,0,0,34,0,32,32,32,32,0,
   0
AT 1170 DATA 0,0,0,0,11,32
SI 1180 DATA North,South,East,West,Up,Dow
   n
JV 1190 DATA A dead bird,Some feathers,A
   metal bucket,A spade,A note,A piece of
    wood,Some ashes
MC 1200 DATA A bow,An arrow,A metal pole,
   A piece of chalk,A knife,An ancient bo
   ok,A parchment scroll
JC 1210 DATA A blazing torch,A bucket of
   water,Water,Birds overhead,Bones,The d
   emon,A wooden chest
SX 1220 DATA A grey curtain,A bed,A crate
   ,A chalk circle,A corpse,A signal fire
   ,A lever,A grey substance
JG 1230 DATA The portcullis,A well,A tabl
   e,A wooden shelf
LL 1240 IF NO)12 AND NO(>37 THEN ? SI$:RE
   TURN
LS 1250 IF NO=37 AND CP=33 THEN ? "You're
    already there.":RETURN
GB 1260 IF NO=37 AND CP=32 THEN ? OK$:CP=
   33:GOTO 1330
OM 1270 IF NO)6 THEN NO=NO-6
HT 1280 IF P(CP,NO)=0 THEN ? "You can't g
   o that way.":RETURN
WJ 1290 IF CP=28 AND DF=-1 AND NO=2 THEN
   DF=2:? "You hear movement behind you."
IQ 1300 CP=P(CP,NO):? OK$
TY 1310 IF CP=100 THEN 3610
IZ 1320 OB(35)=OB(13)
VX 1330 IF CP=32 THEN OB(25)=32
XP 1340 IF CP=33 THEN OB(25)=33
GE 1350 IF CP)24 THEN SETCOLOR 2,0,0
IT 1360 IF CP)27 AND CP(32 THEN SETCOLOR
   2,3,0
HG 1370 IF CP(25 THEN SETCOLOR 2,1,0
PR 1380 IF CP)24 AND OB(15)(>-1 AND OB(15
   )(>CP THEN ? "It's dark.":RETURN
YE 1390 GOSUB 1480+(CP*10)
YK 1400 ? "You can see :"
JK 1410 RESTORE 1190:QW=0
RE 1420 FOR A=1 TO 33:READ X$:IF OB(A)=CP
   THEN ? X$;QW=1
AK 1430 NEXT A:IF QW=0 THEN ? "Nothing sp
   ecial"
XJ 1440 ? "You can go :"
JG 1450 RESTORE 1180:QW=0
EY 1460 FOR A=1 TO 6:READ X$:IF P(CP,A)(>
   0 THEN ? X$;" ";:QW=1
RB 1470 NEXT A:IF QW=0 THEN ? "Nowhere";
TP 1480 ? :RETURN
WL 1490 ? "You are in a small round tower
    room.":RETURN
OX 1500 ? "You are on the roof of a tower
   ,and can  see for miles.":RETURN
XM 1510 ? "You are part way up a spiral s
   taircase.":RETURN
TN 1520 GOTO 1490
RX 1530 ? "You are at the north end of a
   long      hallway.":RETURN
BC 1540 ? "You are in a burnt-out room,ba
   dly       damaged by fire.":RETURN
MJ 1550 ? "You are in the main bedroom,wh
   ich is in disarray.":RETURN
JV 1560 ? "You are in the centre of the u
   pper      hallway,by the main stairs."
   :RETURN
TY 1570 GOTO 1850
AC 1580 ? "You are at the south end of a
   long      hallway.":RETURN
BJ 1590 ? "You are in an old storage room
   .":RETURN
PV 1600 GOTO 1510
PL 1610 GOTO 1580
SL 1620 GOTO 1830
XM 1630 ? "You are at the north end of th
   e lower   hallway":RETURN
FU 1640 ? "You are in the centre of the l
   ower      hallway,by the main stairs."
   :RETURN
FI 1650 ? "You are at the south end of th
   e lower   hallway":RETURN
JD 1660 ? "You are in the library,where t
   he Duke  researched his magical exper
   iments.":RETURN
EO 1670 ? "You are in the banqueting hall
   .There aredeep grooves cut in the floo
   r.":RETURN
XH 1680 ? "You are in the castle kitchen.
   ":RETURN
UT 1690 ? "You are in the courtyard,surro
   unded by  the high walls of the castle
   .":RETURN
TA 1700 ? "You are at the gate.":RETURN
FW 1710 ? "You are on the roof of the gat
   e tower.":RETURN
BF 1720 ? "You are down the well.The wall
   s are coldand damp.":RETURN
MK 1730 ? "You are on a hidden stairway,l
   eading to a secret passage.":RETURN
VO 1740 ? "You are in a secret passage,in
   tended to be an escape route for the D
   uke and his family.":RETURN
DE 1750 ? "You are in a tunnel,which is b
   locked by a rockfall.":RETURN
UK 1760 ? "You are in the lair of the dem
   on.You canfeel an aura of evil.":RETUR
   N
YL 1770 ? "You are in a maze of twisty tu
   nnels,withdamp,red walls.":RETURN
UT 1780 GOTO 1770
UN 1790 GOTO 1770
ZC 1800 ? "You are in the cellar under th
   e castle, where the Duke carried out h
   is magical  experiments.":RETURN
MW 1810 ? "You are in the chalk circle.Th
   e ground  is stained with blood.":RETU
   RN
CW 1820 ? "You are in a dark,damp tunnel.
   ":RETURN
YN 1830 ? "You are in the weapons room of
    the      castle,where the Dukes kept
   their      collections of antique wea
   pons"
BB 1840 RETURN
PK 1850 ? "You are in a panelled room.The
    walls arecovered with marks,which see
   m to have"
AX 1860 ? "been caused by the claws of so
   me great  beast.":RETURN
TQ 1870 ? "100% for not being killed yet.
   ":RETURN
JE 1880 ? "Examine everything.":RETURN
LX 1890 IF NO(13 THEN ? SI$:RETURN
ZL 1900 NO=NO-12
ES 1910 IF OB(NO)=-1 THEN ? "You already
   have it.":RETURN
AM 1920 IF OB(NO)(>CP THEN ? CS$:RETURN
SB 1930 IF NO=21 OR NO=23 OR NO=24 OR NO=
   32 THEN ? "It's too heavy.":RETURN
CJ 1940 IF NO=33 THEN ? "It's fixed to th
   e wall.":RETURN
VJ 1950 IF NO=27 THEN ? "It's too hot.":R
   ETURN
DT 1960 IF NO=17 THEN ? "How?":RETURN
TL 1970 IF NO=28 THEN ? "The idea of the
   game is to survive!":RETURN
YI 1980 IF NO=21 OR NO=29 OR NO=28 THEN ?
    "As you reach towards it,the grey
      substance reaches towards you."
VQ 1990 IF NO=21 OR NO=29 OR NO=28 THEN 7
   00
```

```
AV 2000 IF NO>16 THEN ? "You can't take i
   t.":RETURN
MJ 2010 IF IN=6 THEN ? "You're carrying t
   oo much.":RETURN
BD 2020 OB(NO)=-1:IN=IN+1:? OK$:RETURN
IF 2030 RESTORE 1190:GW=0:? "You are carr
   ying :"
TH 2040 FOR A=1 TO 16:READ X$:IF OB(A)=-1
    THEN ? X$:GW=1
JO 2050 NEXT A:IF GW=0 THEN ? "Nothing"
AS 2060 RETURN
LC 2070 IF NO<13 THEN ? SI$:RETURN
MM 2080 NO=NO-12:IF OB(NO)<>-1 THEN ? "Yo
   u don't have it.":RETURN
GW 2090 IN=IN-1:OB(NO)=CP:? OK$:RETURN
KJ 2100 IF NO<13 THEN ? SI$:RETURN
MF 2110 NO=NO-12:IF OB(NO)<>CP AND OB(NO)
   <>-1 THEN ? CS$:RETURN
XB 2120 IF NO<>13 AND NO<>21 AND NO<>24 A
   ND NO<>30 THEN ? "You can't open one o
   f those.":RETURN
JH 2130 IF NO=13 THEN ? OK$:RETURN
CU 2140 IF NO=24 THEN ? "You try,but fail
   .":RETURN
AM 2150 IF NO=30 THEN ? "How?":RETURN
QJ 2160 IF OB(5)=0 THEN ? "You find somet
   hing.":OB(5)=CP:RETURN
PM 2170 ? OK$:RETURN
LH 2180 IF NO<13 THEN ? SI$:RETURN
ND 2190 NO=NO-12:IF OB(NO)<>CP AND OB(NO)
   <>-1 THEN ? CS$:RETURN
BD 2200 IF NO<>13 AND NO<>24 AND NO<>21 A
   ND NO<>30 THEN ? "You can't close one
    of those.":RETURN
WJ 2210 IF NO=24 OR NO=30 THEN ? "It's no
   t open.":RETURN
DI 2220 ? OK$:RETURN
KU 2230 IF NO<13 THEN ? SI$:RETURN
MQ 2240 NO=NO-12:IF OB(NO)<>CP AND OB(NO)
   <>-1 THEN ? CS$:RETURN
GH 2250 IF VB=10 AND NO=17 THEN ? OK$:RET
   URN
IM 2260 ? "You'll kill yourself...":RETUR
   N
LG 2270 IF NO<13 THEN ? SI$:RETURN
MC 2280 NO=NO-12:IF OB(NO)<>CP AND OB(NO)
   <>-1 THEN ? CS$:RETURN
RA 2290 IF OB(12)<>-1 THEN ? "What with?"
   :RETURN
FC 2300 IF NO<>22 THEN ? "No effect.":RET
   URN
CB 2310 ? "The curtain shrivels and disap
   pears."
GM 2320 OB(22)=0:P(29,1)=29:RETURN
KW 2330 IF NO<13 THEN ? SI$:RETURN
MS 2340 NO=NO-12:IF OB(NO)<>CP AND OB(NO)
   <>-1 THEN ? CS$:RETURN
XI 2350 IF NO<>13 AND NO<>5 AND NO<>14 TH
   EN ? ST$:RETURN
WV 2360 ? "It says..."
BL 2370 IF NO=5 THEN ? "It is very close.
   ..":RETURN
FK 2380 IF NO=14 THEN ? "Throw the remain
   s of fire and burn the  means of fligh
   t.Say mittam.":RETURN
ZE 2390 ? "A demon must be destroyed by a
   agic.All  other methods will fail."
RB 2400 ? "The book gives many reasons fo
   r this,allof them far too technical to
    detail     here."
AL 2410 RETURN
KV 2420 IF NO<13 THEN ? SI$:RETURN
MR 2430 NO=NO-12:IF OB(NO)<>CP AND OB(NO)
   <>-1 THEN ? CS$:RETURN
NP 2440 IF NO<>6 AND NO<>2 AND NO<>13 AND
    NO<>14 THEN ? ST$:RETURN
YB 2450 IF OB(27)<>CP AND OB(15)<>CP AND
   OB(15)<>-1 THEN ? "What from?":RETURN
BL 2460 IF NO=6 THEN ? OK$:OB(15)=OB(6):O
   B(6)=0:RETURN
VJ 2470 ? "It burns leaving no trace.":IF
    OB(NO)=-1 THEN IN=IN-1
GG 2480 IF NO=2 AND CP=28 AND DF=-1 THEN
   ? "The demon is woken by the spell and
        moves towards you...":GOTO 700
BJ 2490 OB(NO)=0:IF NO=2 AND CP=33 AND DF
   =0 THEN ? "Your surroundings momentari
   ly blur.":DO=DO+1:RETURN
AK 2500 RETURN
KU 2510 IF NO<13 THEN ? SI$:RETURN
MQ 2520 NO=NO-12:IF OB(NO)<>CP AND OB(NO)
   <>-1 THEN ? CS$:RETURN
UJ 2530 IF NO<>20 THEN ? ST$:RETURN
RM 2540 ? "You try but nothing happens ex
   cept...":GOTO 700
XF 2550 IF NO<13 THEN ? "You can see noth
   ing from here.":RETURN
MC 2560 NO=NO-12:IF OB(NO)<>CP AND OB(NO)
   <>-1 THEN ? CS$:RETURN
FM 2570 IF NO=5 THEN ? "It's written in b
   lood.":RETURN
DP 2580 IF NO=13 THEN ? "A book about dem
   ons.There is a strange  symbol on the
   cover.":RETURN
CD 2590 IF NO=14 THEN ? "An ancient spell
   .":RETURN
VQ 2600 IF NO=19 THEN ? "They are human."
   :RETURN
VS 2610 IF NO=28 AND DF=-1 THEN ? "It is
   totally motionless.":RETURN
KP 2620 IF NO=28 AND DF=0 AND CP=33 AND C
   B=1 THEN ? "It is trying to enter the
   circle.":RETURN
VE 2630 IF NO=25 AND CB=0 THEN ? "It's br
   oken.":RETURN
IM 2640 IF NO=26 THEN ? "It's the Duke.":
   RETURN
UP 2650 IF NO=28 AND OB(29)<>0 THEN ? "Th
   e grey substance covers it.":RETURN
JE 2660 IF NO=29 THEN ? "It seems almost
   alive.":RETURN
SF 2670 IF NO=22 THEN ? "It covers the no
   rth exit.":NO=29:GOTO 2660
XV 2680 IF NO=32 AND OB(12)=0 THEN ? "You
    find something.":OB(12)=CP:RETURN
EX 2690 IF NO=33 AND OB(14)=0 THEN ? "You
    find something.":OB(14)=CP:RETURN
PL 2700 IF NO=24 THEN ? "It looks fairly
   weak.":RETURN
NL 2710 IF NO=35 THEN ? "It is a circle w
   ith eight arrows        radiating from
    it.":RETURN
GI 2720 ? "You see nothing special.":RETU
   RN
EW 2730 ? "Whee!":RETURN
LH 2740 IF NO<13 THEN ? SI$:RETURN
ND 2750 NO=NO-12:IF OB(NO)<>CP AND OB(NO)
   <>-1 THEN ? CS$:RETURN
RN 2760 IF (NO=28 AND OB(29)<>0) OR NO=22
    OR NO=29 THEN 1910
UW 2770 IF NO=28 AND P(22,4)=0 THEN ? "Th
   e portcullis is raised.":OB(30)=0:P(22
   ,4)=100:RETURN
EW 2780 IF NO<>23 AND NO<>24 THEN ? "Noth
   ing happens.":RETURN
OY 2790 IF P(CP,6)<>0 THEN ? "Nothing hap
   pens.":RETURN
CY 2800 ? "A secret passage is revealed."
EK 2810 IF NO=23 THEN P(CP,6)=25
EZ 2820 IF NO=24 THEN P(CP,6)=34
AZ 2830 RETURN
FB 2840 ? CHR$(34);CM$(I,M);CHR$(34)
ZE 2850 IF CP<>33 OR DO<>2 OR NO<>46 THEN
    RETURN
LJ 2860 ? "As you complete the spell the
   demon     fades from sight and disappe
   ars."
NV 2870 OB(28)=0:DF=-1:OB(29)=0:RETURN
FU 2880 IF DF<>-1 AND (NO<13 OR NO=37) TH
   EN DF=DF+1
RE 2890 GOTO 1240
LP 2900 IF NO<13 OR OB(NO-12)<>-1 THEN 28
   70
BE 2910 NO=NO-12:IF NO<>7 THEN 2890
TN 2920 IF CP<>33 OR DF<>0 THEN 2890
XH 2930 IN=IN-1
BH 2940 ? "It disappears when it hits the
    edge of  the circle."
RV 2950 OB(NO)=0:DO=DO+1:RETURN
LR 2960 IF NO<13 THEN ? SI$:RETURN
NN 2970 NO=NO-12:IF OB(NO)<>CP AND OB(NO)
   <>-1 THEN ? CS$:RETURN
AQ 2980 IF NO<>1 THEN ? ST$:RETURN
XB 2990 IF PL=1 THEN ? "You've already do
   ne that.":RETURN
QR 3000 PL=1:? OK$:OB(2)=CP:RETURN
KL 3010 IF NO<13 THEN ? SI$:RETURN
MH 3020 NO=NO-12:IF OB(NO)<>CP AND OB(NO)
   <>-1 THEN ? CS$:RETURN
UK 3030 IF NO<>24 THEN ? "You fail misera
   bly.":RETURN
FR 3040 IF OB(10)<>-1 THEN ? "You need to
    use something stronger.":RETURN
VO 3050 ? "It is smashed.":OB(24)=0:OB(6)
   =11
```

```
QK 3060 IF P(11,6)=0 THEN ? "A secret pas
   sage is revealed.":P(11,6)=34
AW 3070 RETURN
PT 3080 IF NO<>0 THEN ? SI$:RETURN
KB 3090 IF OB(4)<>-1 THEN ? "What with?":
   RETURN
FW 3100 IF CP<>21 OR OB(11)<>0 THEN ? OK$
   :RETURN
IC 3110 ? "You found something.":OB(11)=C
   P:RETURN
KQ 3120 IF NO<13 THEN ? SI$:RETURN
MN 3130 NO=NO-12:IF OB(NO)<>CP AND OB(NO)
   <>-1 THEN ? CS$:RETURN
AU 3140 IF NO=20 THEN 2510
WY 3150 IN=IN-1
BT 3160 IF NO<>10 THEN ? OK$:OB(9)=CP:RET
   URN
HN 3170 ? "One of them is hit and falls.T
   he rest  fly away."
LE 3180 OB(10)=0:OB(1)=CP:OB(9)=CP:RETURN
ME 3190 NO=NO-12:IF NO<>3 THEN ? SI$:RETU
   RN
DW 3200 IF OB(3)<>CP AND OB(3)<>-1 THEN ?
    "You don't have it.":RETURN
MR 3210 IF CP<>24 THEN ? "Nothing here to
    put in it.":RETURN
KL 3220 OB(16)=OB(3):OB(3)=0:? OK$:RETURN
ZL 3230 NO=NO-12:IF NO<>25 THEN ? SI$:RET
   URN
ID 3240 IF CB=1 THEN ? "Again?":RETURN
DC 3250 IF OB(11)<>-1 THEN ? "What with?"
   :RETURN
TI 3260 IF CP<>32 AND CP<>33 THEN ? "You'
   re not there.":RETURN
IQ 3270 ? OK$:CB=1:RETURN
AY 3280 NO=NO-12:IF NO<>17 THEN ? SI$:RET
   URN
DQ 3290 IF OB(16)<>-1 AND OB(16)<>CP THEN
    ? "It's not here.":RETURN
YN 3300 OB(3)=OB(16):OB(16)=0
XP 3310 IF CP<>13 THEN ? "It runs away.":
   RETURN
SG 3320 ? "The fire is put out.":OB(7,=CP
   :OB(27)=0:RETURN
DS 3330 GOSUB 3470
WS 3340 OPEN #2,8,0,X$
IG 3350 PUT #2,CP:PUT #2,IN:PUT #2,DF+1:P
   UT #2,DO:PUT #2,PL:PUT #2,CB
BL 3360 FOR A=1 TO 33:PUT #2,OB(A)+1:NEXT
    A
QU 3370 PUT #2,P(7,6):PUT #2,P(11,6):PUT
   #2,P(29,1)
AU 3380 CLOSE #2:SOUND 0,0,0,0
BI 3390 RETURN
DL 3400 GOSUB 3470
UH 3410 OPEN #2,4,0,X$
LP 3420 GET #2,CP:GET #2,IN:GET #2,DF:GET
    #2,DO:GET #2,PL:GET #2,CB:DF=DF-1
KO 3430 FOR A=1 TO 33:GET #2,P:OB(A)=P-1:
   NEXT A
LM 3440 GET #2,P:P(7,6)=P:GET #2,P:P(11,6
   )=P:GET #2,P:P(29,1)=P
NV 3450 CLOSE #2
QN 3460 GOTO 1330
IE 3470 ? "Tape or disc (T/D)?"
SV 3480 TRAP 3570
BA 3490 GET #1,A:A$=CHR$(A):IF A$="T" OR
   A$="t" THEN X$="C:":RETURN
MT 3500 IF A$<>"D" AND A$<>"d" THEN GOTO
   3490
BN 3510 ? "POSITION (0-9)?";
GJ 3520 GET #1,A:IF A<48 OR A>57 THEN 352
   0
BH 3530 X$="D:DEMON .SAV"
TR 3540 X$(8,8)=CHR$(A)
AG 3550 ? CHR$(156);"POSITION ";A-48
BD 3560 RETURN
DC 3570 ? "ERROR":CLOSE #2:SOUND 0,0,0,0:
   RETURN
QA 3580 ? "Are you sure (Y/N)?"
RA 3590 GET #1,A:A$=CHR$(A):IF A$="Y" OR
   A$="y" THEN GOTO 710
AN 3600 RETURN
GL 3610 ? "CONGRATULATIONS":? "You have e
   scaped.":GOTO 710
YS 30000 ? CHR$(125);"DEMON by Adrian Cox
   "
VW 30010 ? :? "As a servant in the castle
    of Baron Azkayou know that he experim
   ents with magic.";
BX 30020 ? "You also know that he is very
    clumsy.Thetwo do not go together."
GL 30030 ? "The Baron has had an unfortun
   ate        accident and released a dem
   on in the"
HW 30040 ? "castle. You have escaped by h
   iding in a tower room, but you cannot
   hide there "
CU 30050 ? "for ever. It is now morning."
QP 30060 ? :? "The program understands tw
   o word inputs such as 'TAKE AXE' and '
   BURY STICK'."
SH 30070 ? "Useful commands are 'LOAD', 'S
   AVE' and  'QUIT'. Directions can be a
   bbreviated to";
IG 30080 ? "a single letter, 'INVENTORY'
   to 'I' and 'LOOK' to 'L'. Examine ever
   ything to"
RS 30090 ? "find clues."
DD 32000 RETURN
```


PAGE 6 THE MAGAZINE FOR ALL ATARI COMPUTER* OWNERS

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USER GROUP SOFTWARE

Software Librarian - Roy Smith

Due to demand from members there are now two ways to get programs from the library. The original scheme of exchanging 3 for 1 will still apply, but now with an added bonus. So the library rules have been extended to enable those members who cannot write their own programs to gain access and those that can to have a possibility of some reward for their efforts. The extended library rules are as follows.

3 FOR 1 EXCHANGE

1. Every program you donate to the library entitles you to three programs in return.
2. The program you donate must be your original and not copied.
3. Your donated program must be submitted on a cassette or a disk. programs in the form of printouts will not be processed.
4. If your program requires any special instructions they should be added in the form of REM statements within the program or you may present them as instructions when the program is actually run.
5. BONUS. Every program donated per quarter (between issues of the newsletter) will be eligible to be judged 'STAR PROGRAM' for that quarter. This carries a prize of £10 which will be paid to the author from the club funds. The programs will be judged by the Editorial Team and their decision will be final. The Editorial Team are not eligible for the prize.
6. The 3 FOR 1 exchange is only open to club members.

DONATION SCHEME

1. Every club member will be entitled to ask for up to 3 programs per quarter from the library by donating to the club funds.
2. If a member does not take his/her entitlement for a particular quarter it cannot be carried forward to the next quarter.
3. A member can have more than one quarter's entitlement at one time (up to a maximum of 12 programs i.e. 1 year) but then will be unable to ask for more until his/her credited quarters have been used. Note that odd numbers of programs will be counted in quarters i.e. if a member asks for 5 programs the first 3 will be the quarter's entitlement, the next 2 will be the second quarter's entitlement and he/she will have to wait until the third quarter before he/she is entitled to any more. Also note that having programs in advance will only be allowed if that member's membership covers the advance quarters.
4. The donation fee will be £1 per program and is not refundable. Cheques and Postal Orders are to be made out to the 'U.K. Atari Computer Owners Club'.
5. Members must send in a blank cassette or diskette for the chosen programs to be recorded on.
6. The 'DONATION SCHEME' is only open to club members.

Finally, I would like to point out that some people omit to include return postage when donating to the library, so please do not forget to include 30p worth of stamps to cover this.

THE LIBRARY SOFTWARE SERVICE IS FOR MEMBERS ONLY

LIBRARY SOFTWARE TITLES

Listed below are the software titles received by members for inclusion in the library since issue twelve was published. As the library now contains over 300 programs, it is getting a bit too large to keep on printing the entire list. Eventually it would probably take over the whole magazine and there would be no room left for the articles and program listings. For those of you who are new members and do not know what is available from the library, then send for a photocopy of the complete list which is available from the librarian. There is a small charge for this service to cover photocopying costs. If you would like a list please send 50p and a S.A.E. for return.

Games

ATARI ATTACK
by Gavin Jones & Alan Ransom - Epsom.
Prevent the enemy from bombing your cities.
Runs in 32k Cassette or Disk min.

BACK IN TIME
by Matthew Timby — Bristol.
Pinball game developed using Pinball Construction Set.
Runs in 48K min Disk only.

BOBAJOB
by Gavin Jones & Alan Ransom — Epsom.
BMX Bob as to avoid the obstacles.
Runs in 32K Cassette or Disk min.

★★★★ STAR PROGRAM ★★★★

PENGO
by Gavin Jones & Alan Ransom — Epsom.
Excellent version of the well-known Penguin game.
Runs in 32K Cassette or Disk min.

★★★★★★★★★★★★★★★★

YAHTZEE 2
by Peter Burnett — Wellingborough.
Up to six players can use this well-known game.
Runs in 16K Cassette or 32K Disk min.

3D INVADERS
by Gavin Jones & Alan Ransom - Epsom.
Destroy them before they get you!
Runs in any size.

Adventure Games

CHEAT
by Adrian Cox — Reading.
Search through adventures to find clues.
Runs in any size.

CITY OF THE DWARFS
by Adrian Cox — Reading.
Search the city for treasure.
Runs in 32K Cassette or Disk min.

DEMON
by Adrian Cox — Reading.
Baron Azka's Demon has escaped and it's after you.
Runs in 32k Cassette or Disk min.

Home Entertainment

EZEEDISCO
by Paul Rixon — Shelford.
Provides dancing lights to your favourite music tape.
Runs in 16K min. Cassette only.

FLASHBACK
by Gary Cheung — Harold Wood.
Simon type game.
Runs in 32K Cassette or Disk min.

QUIZ
by Peter Burnett — Wellingborough.
Can you answer the questions correctly?
Runs in 16K Cassette or 32K Disk min.

Utilities

CAD/CAM EDITOR
by D.J. Canning — Benson.
To be used with Gilchrist/Havens CAD/CAM program to give easier data entry.
Runs in any size.

COPIER
by Kevin Dance — Reading.
Basic compiler for making back-up Disks.
Runs in any size Disk only.

DATAMAKE
by Kevin Dance — Reading.
Takes a machine code routine from memory and creates data statements.
Runs in any size.

DUMP 1029
by Kevin Dance — Reading.
Load Micro-Painter pictures and dump them to a 1029.
Runs in any size.

HOUSEKEEPER
by Iain Macdonald — Glasgow.
Useful for mass Disk formatting, etc.
Runs in any size.
XL/XE machines only.

TOP TEN

1	(1)	Home FM	Mike Barnard
2	( )	Fujiboink	Unknown
3	(2)	Cad/Cam	Jack Gilchrist & Phil Havens
4	(8)	Composed Writer	Larry Farmer
5	(5)	Chase	Graham Fairall
6	( )	Magazine Database	Alan J. Palmer
7	(-)	Another Boring Space Invaders	Bob Askew
8	( )	General Ledger	Neville R. Will
9	( )	Shuttle Challenge	Matthew Trimby
10	( )	Multilabel Maker	C.P. Weldon

JOYSTICK SKETCHPAD
by Adrian Barton — Welwyn Garden City.
Graphics and drawing program which can be used with Technicolour Dream pictures.
Runs in 32K Cassette or Disk min.

LISTER
by J. Bennett — Killingworth.
This program reads in programs in list format and prints them out.
Runs in any size.

LOADOBJ
by Kevin Dance — Reading.
Loads object files from Disk or Cassette created by the Atari Editor/Assembler Cartridge.
Runs in any size.

MULTI-MODE PICTURE MENU
by Brian Chrishan — Wirral.
Allows picture to be displayed in many modes. Compatible with Micropainter and Touch Tablet pictures. Includes Pixe averager, help screens, and example pictures.
Runs in 48K min. Disk only.
Requires one side of Disk.

PICTURE SHOW 5
by Keith Berry — Birmingham.
Eight Graphics 9 pictures loaded from a menu.
Runs in 32K min. Disk only.

PICTURE SHOW 6
by Keith Berry — Birmingham.
Eight Graphics 9 pictures for use with 130XE RAM Disk and in Sparta DOS V2.3e format.
Runs in 32K min.
For 130XE only.

Music

SOUNDS EZEE 1
by Paul Rixon — Shelford.
'When the Saints go Marching in' with chord accompaniment and words.
Runs in any size.

An event NOT to be missed!

Atari Christmas Show

Royal Horticultural Hall
Westminster, London SW1

Friday November 28 10am-6pm
Saturday November 29 10am-6pm
Sunday November 30 10am-4pm

The first ever Atari Show last spring was an outstanding success From all over Britain Atari enthusiasts flocked to London to find out all they could about their favourite machine.

Soon the record breaking Atari Show will be back – with three days devoted to the exciting developments in this expanding market. Make a note in your diary NOW to make sure you don't miss this great Christmas extravaganza!

- ★ All the latest software from publishers in both the UK and USA
- ★ New hardware releases from Atari and other major companies
- ★ Experts from Atari User and Atari ST User to answer your questions
- ★ Experience the fascinating world of computer communications
- ★ Everything on show from stocking fillers to complete Atari systems

Whether you're a new user or a seasoned addict, you'll find the show overflowing with ideas to help you expand your computing horizons!

They'll all be there! Games consoles, 8 bit machines . . . the entire ST range!

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HOT GOSSIP

Imitate or Emulate?

If you can t imitate, emulate? This seemed to be the predominant theme during the most recent wave of computer shows .n America Atari Corp and third party developers announced products that will one day make the 520 1040ST compatible with not one but three new Operating System environments The CP M Z80 emulator has already left the launch pad here in Europe and is available free of charge from your dealer and wil open up your ST to a whole new world of computer software based around an industry standard operating system IBM and MS DOS compatibility is an emulator we have all heard about and with a price tag of $300, is an emulator we are all waiting for Lotus 1 -2 3 running under Atari s IBM PC emulator box and on a composite monitor is said to be running lightning fast! As if this were not enough, Dave Small and his newly formed company Data Pacific is trying to bring to the market his already working Apple Macintosh emulator for the ST The ST has already been seen running the Apple Mac's Bouncing Ball demo and MACdraw!

1st Word Plus

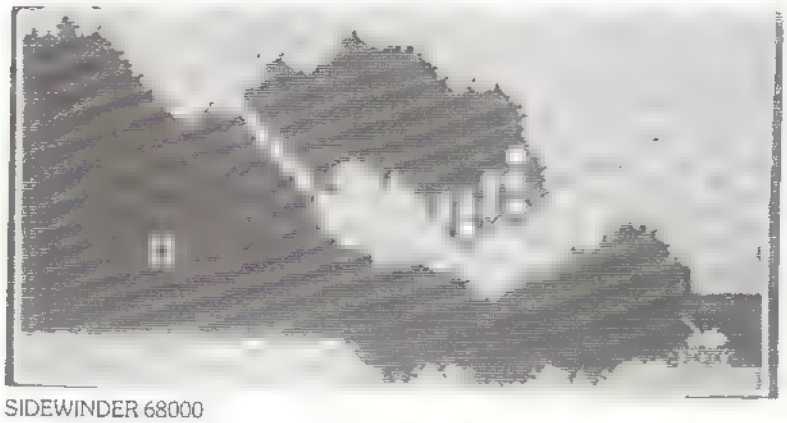
The authors of 1st Word are planning to have 1st Word Plus released for the PCW show and will include such features as an integrated 38000 word spelling checker new text formatting techniques (including visible pitch changing and word deletion with the use of Icons) Mail Merge facilities to Stonewares DB-Master One and Laser Softwares Laserbase, together with graphical capabilities to handle NEOchrome and DEGAS pictures in your documents

ST Arcade Action

SIDEWINDER, recently released for the Atari 8 bit computers is now being converted to the ST by Futureware and is running under the beta test name of SIDEWINDER 68000 It includes 10 levels of ten screens each with its own 256 character set making a total of 2 mega bytes of uncompacted program code. An editor is to be included free of charge

ST Graphics Power

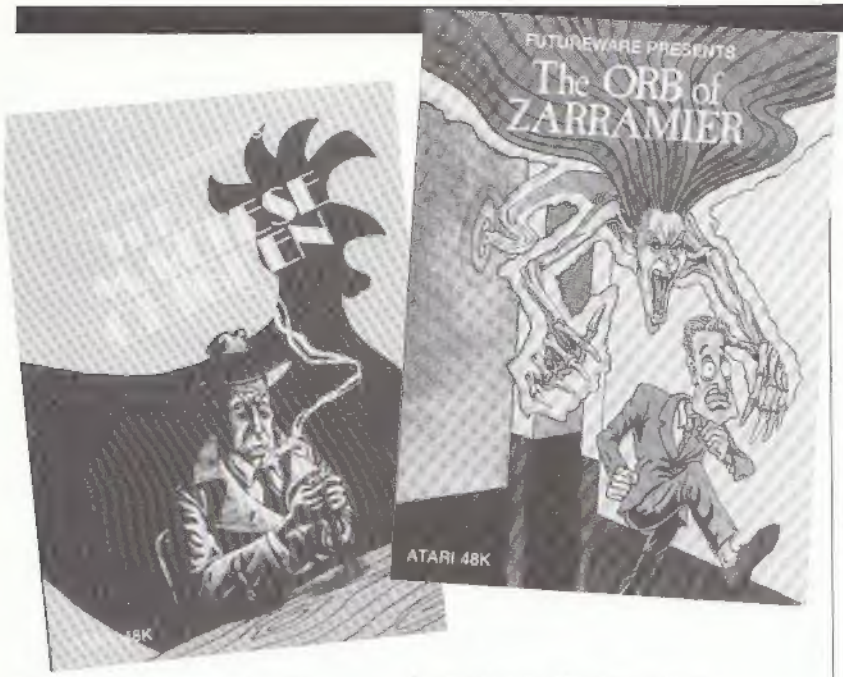
For those fortunate enough to have seen the Amiga and its 'Golden Face' demo, can now look forward to a similar art package for the ST programmed by Andromeda who have a prototype up and running capable of bending NEO and DEGAS pictures around the screen with no pixel stretch and placing them around spheres and cubes Also included are Zoom Copy, Rotate and Animate routines If you got excited about DEGAS or CAD 3D watch out for this one!



SIDEWINDER 68000

Activision have several new titles coming out Trinity is a Science Fiction Fact adventure incorporating Infocom s new parser giving a large vocabulary of over 2000 words It starts when you are touring in London and time suddenly slows, you find there is only a few seconds to live as a nuclear bomb is falling on the city You must somehow pass back in time through nuclear explosions of the past, back to the very first nuclear test, code named 'Trinity' You arrive before the test is to happen what will you do? Will you stop the test or let it happen? Release date is the 25th August and the disk is priced at £34.99

Another Infocom adventure to be published by Activision is Leather Goddess of Phobos' A sure fire hit this one! It starts fairly normally for an infocom adventure in other words a slimy alien abducts you from a sleazy bar and transports you to Phobos, the home of the Leather Goddess Thrown into a cell you discover that the Goddesses have plans to perform various experiments on you You can play this role in male or female mode and depending on which you pick different types of experiment are to be performed There are three levels of play tame suggestive or lewd Some choice eh! Your aim is to escape the cell and construct an anti Goddess machine Scheduled for September, with disk priced at £29 99 and includes 3D-glasses and 'sniff-and scratch' pad Other products for September are Shanghai , based on Majong, and Hacker 2, sub-titled The Doomsday Papers' where you must hack into a Soviet system in Sibena take over control of some droids and get them to steal the papers Scheduled for October is Infocom's Moon Mist priced at £29 99



Multitasking Power on the ST

Since the launch of the Amiga, Multitasking has been a thorn in Atari's side. Until now that is. MicroRTX is a true Multitasking operating system for the ST and is capable of running anything from a simple printer spooler to a fully blown Bulletin Board while completing another task!

New Releases

Colour Space 2 for the ST should soon be available. It features an option called Gravity which enables you to bounce a picture about the screen whilst running normal colourspace graphics.

International Karate is being written by System 3 for the ST and will be marketed by Andromeda.

Atari's Promise Comes True

Atari had promised devotion to the 8-bit range of computers, and judging by the recent American shows it certainly appears that they have kept to their promise. The Atari XP801, 80 column board, was shown for the first time in America recently. The board which is about 7in. x 4in. plugs into the Joystick port and not the expansion port as previously suspected. Once connected it will be able to drive any Monochrome monitor. Also contained in the package is a standard centronics printer port. Possible beta version may be seen at the PCW show but has an official American release date of November for $80. Memory upgrades are now also expected from Atari for the XE following the recent flood of memory upgrades for the 800 (256k, 2 and now 4 meg!).

500k 3.5in. disk storage for the 8-bit computers is now alive. The Disk Operating System is being written by Bill Wilkinson at OSS (designer of Dos 2.0/2.5) and the drive is said to have been seen at Atari's testing area in California. Hard Disk drives of up to 10Mb are already being manufactured by third party companies.

8-bit Software News

A little birdie told me that Mastertronics £1.99 software is soon to be converted from cassette to disk. Vegas Jackpot, The Last V8 and Kik Start are to be converted to disk for sale at £4.99 after Mastertronic directors were told by Atari Corp that they had sold thousands of disk drives in the last year. Mastertronics first ST release is also under development but at this time no further details are known on this one.

Another company getting in on the budget software boom is Futureware. After recently making a name for themselves in the Atari market with SIDEWINDER, Futureware are to release two games within the budget price range. The Quest for the Maltese Chicken is an addictive platform game with multiple levels. The Orb of Zaramier is the second title, with over 250 screens to explore and find the hidden treasures and the secret Orb. A clever game worth far more than £2.99! Both titles should be available by the time you read this. Also being developed by Futureware is a game similar in style to Uridium on the Commodore. Futureware's version by programmer Paul Carr is still under development and is currently called Intruder and includes multiple levels, 3D graphics, warp facilities and 4-way scrolling. £14.95 for disk, £9.95 for cassette are the suggested prices, with a release date of December.

Red Rat, the Manchester based software house, have six new releases planned for the autumn. Domain of the Undead is an arcade game of ghosties and ghouls, spectres and phantoms, and mid-night romps through the cemetery. Astro Droid is a space environment game in which all the back-drops have been created using Technicolor Dream. Warcopter, possibly to be released in September, is a 4-way scrolling landscape arcade game with strategic elements. Anvil's 'Day at the Races', is being repackaged and sold under the Red Rat banner. It is a game ideal for parties or family get togethers. These four programs are all priced at £9.95 for disk or £7.95 for cassette. Red Rat's other two games are being released as a budget line at £4.99 for disk and £2.99 for cassette. Both are scheduled for September. Freaky Factory is a multiscreen 'Shamus' type shoot-em-up, and Rocket Repair Man is also a 'shoot them or die' arcade type, subtitled the Further Adventures of Cavern Commander!

MONITOR ON DISK

Like the look of a program but can't find the time to key it in? You've asked the wife three times to do it for you whilst you're out at work, and she still hasn't. Or maybe you have typed it in but it won't run, then why not take all the effort out of it and send for the MONITOR DISK. All the main programs in each issue of MONITOR are now available pre-recorded on disk for you. They cost £4.95 which includes postage and packing, send a cheque/postal order made payable to the 'U.K. Atari Computer Owners Club' to Monitor Magazine, P.O. Box 3, Rayleigh, Essex. If you live in Europe add 50p, if outside Europe add £1.00.

Monitor Disk 8.
Includes: Quickplot, a fast Graphics 8 Plot/Drawto handler. Nightmare Reflections, an exceedingly frustrating adventure. Matchbox, improve your concentration with this memory game. Interrupts, 5 demo programs showing various uses of interrupts.

Monitor Disk 9.
Includes: Keyo, a new typing checker. Multiboot Bootbase, database program for 'Multiboot disks'. Binload, binary loads from BASIC. Happytyper, automatic line numbering. Ramdisk, for use with the 130XE. Fast Fill, a speedy shape filling utility.

Monitor Disk 10.
Includes: 3D Maze, escape from the maze in time if you can. PCB Paranoia, destroy your enemies before they get you. Disk Jacket, useful program for making your own disk covers. Chase, an excellent game, not to be missed.

Monitor Disk 11.
Includes: Hexadecimal Code Generator, better presentation for your programs. Cracking the Code, seven mini progs from the series. RAM Talker, with a little bit of hardware and this program, you can hear your own voice, (for 400/800 only). Bonus Program: HomeFM, a useful utility for use with Home Filing Manager to give quick access to data disks.

Monitor Disk 12.
Includes: Another Boring Space Invaders Game, unlike its name suggests this game is rather good and lots of fun. Get Motorised; four programs for use with the circuits described in this interesting article. Mini-adventure; can you escape in one piece? Cracking the Code; BASIC listing and assembler code for a drawing program. Opening Out, five useful programs for disk drive owners.

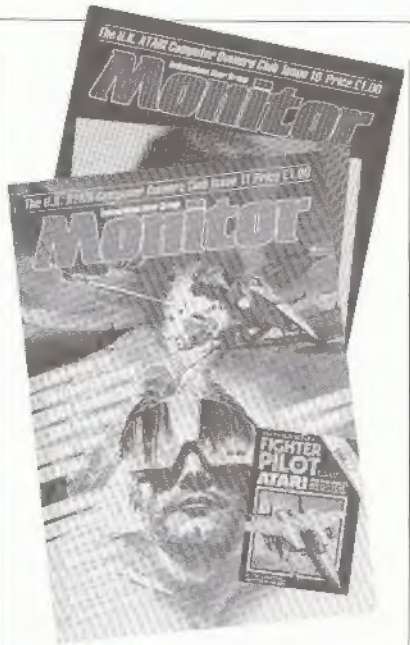
Monitor Disk 13.
Includes: Demon, the Barons demon has escaped and it's after you! Pageflipper, basic and source code listings for page flipping techniques. Cracking the Code, basic and source listings for player/missile movement. Adventure Column, data de-compression program.
Bonus Program: Pengo, excellent basic version of the well-known Penguin game.

BACK ISSUES

Previous issues of this magazine are obtainable from the club for £1 plus 30p postage each. They contain many interesting and informative articles, hints & tips, program listings for you to input, reviews and practical advice. If you have missed out send for your copies of back issues today! Please note that issues 1,2,3,4,5 & 7 are already sold out.

Issue 6.
Includes a useful tutorial showing how to print Micropainter and Versa-writer pictures, also contains a terrific program demonstrating 80 characters across the screen. A new regular column for adventure enthusiasts is started to give reviews of adventure games and give hints and tips on how to play them. Part two of Cracking the Code continues with addresseing modes and binary sums. The hardware design for a Light Pen is shown together with some simple programs use with it once you have built it. Fun with Art from Epyx is reviewed and some of the excellent results of using this package are shown. Programs include Planetron and a RTTY listing for use with a short wave band radio, the Atari 850 interface and a signal terminal unit (such as the Maplin TU1000).

Issue 8.
Contains a preview of the new Atari computers. Two new series start, one about how files work and the other 'Starting from Basics' for beginners. Cracking the code continues and concluding part of 'Interrupts' discusses horizontal and vertical scrolling. The adventure column includes reviews of



Mask of the Sun and Sorcerer. Other reviews include Conan, Spy vs Spy, Alley Cat and Ghostbusters. Programs are Matchbox, a concentration game, Quickplot, a Graphics 8 Plot/Drawto utility and Nightmare Reflections, an exceedingly frustrating adventure.

Issue 9.
Includes a RAMDISK for the 130XE as well as a review of this excellent machine. Introduction to MIDI, just what is it! KEYO typing checker program. Utility to give binary load files from Basic. Reviews of TopDOS, Homeword and Mr DO! Overview of FORTH as an alternative to Basic. Utility to fill in shapes in Graphics 8 and fast too! Profile on Lea Valley Atari Club. HAPPY TYPER gives automatic line numbers and programmable function keys. Utility for indexing 'Multiboot' disks.

Issue 10.
Includes all the facts about Digitised Pictures. Disk Jacket, a neat program for making your own disk covers. Opening Out, more about how files work. Reviews of the Great American Road Race, Kennedy Approach, Red Moon, Asylum and Wishbringer. Two excellent games: PCB Paranoia and 3D-Maze. Introduction to the world of communications. Continuation of regulars: Cracking the Code, Starting from Basics and What's MIDI?

Issue 11.
Includes RAM Talker for 400/800 machines. Reviews of Atariwriter Plus, Sidewinder, Koronis Rift, Electraglide, Mercenary, Fighter Pilot, Goonies and Alternate Reality. ST MIDI programs and ST hi-res Hat. Hexadecimal Code generator and some book reviews. Plus Starting from Basics and Cracking the Code.

Issue 12.
Includes: Get motorised, add-on circuits for various motors. Another Boring Space Invaders game, but it isn't, boring that is! Part 3 of Opening Out discusses disk file handling techniques. Read all about Matrices and Arrays, and the adventure column shows how to write your own adventure. Eight-bit reviews include Technicolor Dream, Eidolon and Action Biker. ST reviews include DB Master One, Time Bandit and Menu Plus.

ATARI ST

Power Without The Price!

520ST PACKAGES

The 520ST-M keyboard costs only £348.96 (+VAT=£399) and includes an RF modulator and cable, allowing you to connect it to an ordinary domestic TV set. The keyboard is supplied with 512K RAM, a mouse and a free set of 3½" disks containing applications software. For a limited period from August 11th 1986, we have some special packs offering combinations of the 520ST-M keyboard with a ½ Mbyte SF354 Atari disk drive and an Atari monitor (either the Mono SM124, or Colour CM36512). These packages offer up to £200 extra discount on a system. If purchased from Silica, they also come with our free 'ST STARTER KIT'. All of the pack prices shown in the chart include VAT.

UPGRADE TO 1024K RAM

We are pleased to be able to offer a 1Mbyte upgrade on the standard 520ST keyboard to increase the memory from 512K to a massive 1024K. It has a full 1 year warranty and is available from Silica at an additional retail price of only £86.96 (+VAT=£100). Any of the five packs can be upgraded to 1Mbyte for only £100. The 1Mbyte ST offers a low price alternative to the 1040, but also gives you the benefit of an RF modulator (not normally fitted on the 1040).

	ALL PACK PRICES INCLUDE VAT	PACK 1	
£100 DISCOUNT 1 DISK DRIVE		Keyboard	£399
		Disk Drive	£149
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		Discount	£100
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£150 DISCOUNT 2 DISK DRIVES + MONITOR	PACK 2 (MONO)	PACK 3 (COLOUR)	
	Keyboard £399	Keyboard	£399
	Disk Drive £149	Disk Drive	£149
	Disk Drive £149	Disk Drive	£149
	Mono Monitor £149	Colour Monitor	£299
	Normal Price £846	*Normal Price*	£996
	Discount £150	*Discount*	£150
	Pack Price **£696**	**Pack Price**	**£845**
£200 DISCOUNT 2 DISK DRIVES + MONITOR + PRINTER	PACK 4 (MONO)	PACK 5 (COLOUR)	
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	Disk Drive £149	Disk Drive	£149
	Mono Monitor £149	Colour Monitor	£299
	Printer (SMM804) £199	Printer (SMM804)	£199
	Normal Price £1045	*Normal Price*	£1195
	Discount £200	*Discount*	£200
	Pack Price **£845**	**Pack Price**	**£995**

REDUCED PRICES

Atari's ST personal computers are now firmly established both in the USA and Europe. The main attraction of the ST range is the value for money which these computers represent, giving both private and business users a powerful asset at a very modest price. There are now several ST packages available from Silica at a reduced price, further enhancing the Atari 'Value for Money' reputation. In addition, we are giving away a FREE Silica 'ST STARTER KIT' with every 520 or 1040 ST purchased at Silica Shop. These offers will only be available for a limited period and commence on 11/8/86.

POWER FOR BUSINESS

The list below shows some of the new business products which have been recently launched for the Atari ST range. It gives an indication of the ST's potential to business buyers looking to install a powerful, low-cost system.

CP/M EMULATOR
20Mbyte HARD DISK
LOTUS 123™ CLONE
dBASE III CLONE
IBM COMPATIBILITY
VT100 EMULATOR
MICROSOFT WRITE
dBASE II

Any ST computer will provide its user with a very powerful asset, utilising a vast range of applications, particularly in the business world. Many software companies have been quick to recognise it for its business potential, and have produced programs for the ST which harness this potential. In addition, there are several peripheral and hardware products becoming available to add to the ST's 'Power For Business'. Software now available includes dBMan, a dBASE III clone as well as H&D Base, a dBASE II clone. In fact, First Software have now launched Ashton Tate's original dBASE II program for the ST. In addition, PC Intercomm is a VT100 emulator which enables you to use any ST keyboard as a terminal connected to a mainframe or mini. Other programs include a powerful accounts package by Cashlink and a Lotus 1-2-3™ clone called VIP Professional. Microsoft have announced that their powerful word processor 'Microsoft Write' will soon be available for the ST. Many packages are available for very specific market applications including a powerful CAD (Computer Aided Design) program called Easy Draw from Migraph. In addition, there is an engineering tool called PC Board Designer by Abacus Software which will enable the user to design printed circuit boards. For further details of how the ST can help in your business, return the coupon below. We will be pleased to send you our latest newsletter and price list.

PRICE MATCH PROMISE

We hope you will find that the combination of our low prices, FREE delivery service, FREE Starter Kit and after sales support, will be enough to make you buy your Atari equipment from Silica Shop. If however, there is something you wish to purchase, and you find one of our competitors offering it at a lower price, please contact Owen Pascoe (Office Manager), or one of the telesales staff in our sales department. When you telephone us, please provide us with our competitors name, address and telephone number. Providing our competitor has the goods in stock, we promise to match his offer (on a 'same product - same price' basis) and still provide you with our normal free delivery. You will also be entitled to our full after sales service, including free newsletters and technical helpline support. We don't want you to go anywhere else for your Atari products. So shop at Silica, the U.K.'s undisputed No1 Atari specialist.

FREE SOFTWARE

When you buy a 520 or 1040 ST computer keyboard from Silica Shop, you will receive a large and varied software package free of charge. This package consists of twelve programs. Wherever you purchase your Atari ST computer, you should receive the first six software titles as standard. However, if you purchase your ST from Silica, you will also receive a further six extra titles, giving you a total of twelve. All ST's now have TOS/GEM already installed on ROM, so the list of free software you should receive is as follows:

1) GEM - *DR Desktop environment with WIMP (fitted in ROM)*
2) TOS - *Tramiel Operating System (fitted in ROM)*
3) 1st WORD - *Word Processor by GST using GEM*
4) BASIC - *Personal Basic by DR (with manual)*
5) LOGO - *Logo language by DR (with manual)*
6) NEOCHROME - *A powerful colour paint and graphics package (only useable with colour systems)*

If you purchase your ST from Silica, not only will you receive the standard six pieces of software as listed above, but we will also give you the following six additional programs FREE OF CHARGE:

7) MEGAROIDS - *Asteroids type game by Megamax*
8) DOODLE - *Simple paint-doodle drawing package (works on mono or colour systems)*
9) CP/M EMULATOR - *Allows use of DR's Z80 CP/M software to run on the ST range*
10) CP/M UTILITIES - *Various utilities to use with CP/M*
11) DEMONSTRATION & PUBLIC DOMAIN SOFTWARE - *Various games, demos and accessories*
12) CARDS - *A unique set of card games from Microdeal*

These additional free software titles are all part of the FREE Silica 'ST STARTER KIT', return the coupon below for further details.

FOUR FREE MANUALS

In addition to the free software which will be given to you when you buy your ST from Silica, you will receive four free manuals:

1) **ST OWNERS MANUAL (80 pages):** *Easy access to the information you require to unpack, set-up and become familiar with the ST.*
2) **ST BASIC SOURCE BOOK & TUTORIAL (240 pages):** *Gives you the information to increase your level of programming expertise.*
3) **ATARI LOGO SOURCE BOOK (77 pages):** *A source book for Logo, showing how to use the language in the GEM environment.*
4) **1st WORD MANUAL (48 pages):** *Instructions for 1st Word.*

ST NEWSLETTER

8 PAGES OF INFORMATION TO HELP YOU TO DECIDE
RETURN THE COUPON FOR A FREE COPY

1040ST-F

For the businessman and the more serious home user, there is the 1040ST-F with 1028K RAM. This can be used in a business environment as a stand-alone system, or can support a mainframe computer as a terminal. The 1040ST-F keyboard with integral 1Mb disk drive costs only £699 (+VAT=£803.85). As the 1040ST-F was manufactured solely with business use in mind, it does not come with an RF modulator for use with a domestic TV. Instead, it requires a monitor. There are three Atari monitors available and the prices for the 1040 with these monitors are as follows:

1040 Keyboard Without Monitor - £699 (+VAT= £803.85)
1040 Keyboard + High res mono monitor - £799 (+VAT= £973.85)
1040 Keyboard + Low res colour monitor - £899 (+VAT=£1033.85)
1040 Keyboard + Med res colour monitor - £999 (+VAT=£1148.85)

The 1040ST-F includes 1Mbyte of RAM as well as a 1Mbyte double sided disk drive and mains transformer, both built into the keyboard to give a compact and stylish unit, with only one mains lead. The 1040ST-F is supplied with a set of software discs as well as our own FREE Silica 'ST STARTER PACK'. Call into your nearest branch of Silica Shop for a demonstration.

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At Silica we have been successfully dedicated to Atari ever since their products first appeared on the UK market. We can attribute our success largely to the Atari specialisation which we practice and to the user back-up we provide. Rest assured that when you buy a piece of Atari hardware at Silica you will be fully supported. Our mailings giving news of software releases and developments will keep you up to date with the Atari market and our technical support team and sales staff are at the end of the telephone line to deal with your problems and supply your every need. With our specialist bias, we aim to keep stocks of all the available Atari hardware, software, peripherals and accessories. We also stock a wide range of Atari dedicated books and through us, the owners on our list can subscribe to several American Atari dedicated magazines. We can provide a full service to all Atari owners and are now firmly established as the UK's NUMBER ONE Atari specialists. Here are just some of the things we can offer to our customers.

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